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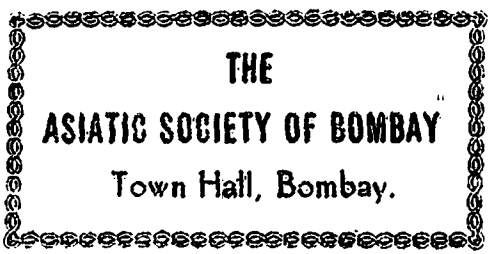

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THE

PASSIONS OF ANIMALS.

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BY

EDWARD P. THOMPSON.

"Is not the earth
With various living creatures, and the air
Replenish'd, and all these at thy command
To come and play before thee? Know'st thou not
Their language and their ways? They also know
And *reason* not contemptibly. With these
Find pastime."

MILTON.

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PREFACE.

The subject of the following pages has been treated of, to some extent and in various ways, by other English writers; but it has not, as the Author believes, been put into the condensed form in which he has attempted to present it. In collecting his materials, he has spared neither labour nor research, and he is indebted for much valuable matter to the numerous writers and travellers whose works he has quoted; particularly to Dr. Schmarda, whose little work, entitled "Andeutungen aus dem Seelenleben der Thiere," he met with when travelling in Germany three or four years since; and, though he had at that time made some progress in his contemplated work, he felt that Dr. Schmarda had so completely embodied the plan he had in view, that he could not do better than adapt his own ideas to the Doctor's arrangement, to whose text he is also much indebted.

In the choice of anecdotes, illustrative of the various Passions of Animals, the author has endeavoured to

select those of a novel, or at least of an unhackneyed character; and, should he not have been successful in all instances, he can only say, in imitation of the furrier, who on being asked for a new kind of fur, replied, that it had not pleased Providence to make any new animals; that it has not pleased the animal world to distinguish itself by any new traits or feats.

The chief object in writing these pages, irrespective of the attraction of the subject to him, has been to assist in promoting a better estimate of the value and utility of animal life, and by awakening a due regard and kindly feeling for the brute creation, to obtain for it the admiration and protection it so signally and justly deserves.

E. P. T.

May 16, 1851.

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THE PASSIONS OF ANIMALS.

INTRODUCTION.

THE more we examine into the vast mystery of the Creation, the more wonderful does it appear to our senses. New features present themselves under whatever aspect we consider it, proving, not only that the subject is inexhaustible, but that some of the most startling points have perhaps altogether escaped us, or have been but barely noticed. Without attempting to account for them, or to reconcile theories and speculative ideas with the words of Holy Writ, there are some most reasonable deductions to be gathered from the inspired writings, which bring us to a certain barrier, beyond which neither our imaginations nor understandings can penetrate. We perceive that there are distinctions, and that a different principle and a new power presided over that part of the creation which called man into existence, and there our faculty ceases. And it is this very difference which overwhelms us with its magnitude, and makes us feel that the Power which made all things perfect, yet intended man for higher and nobler destinies than it assigned to its other works.

The language used in this, the last and mightiest

work, "*and God said, Let us make man in our image, after our likeness,*" stamps at once the fact, that the creation to be formed was intended to be the only one capable of reason and reflection,—a peculiarity of intention and proceeding absent from the other works, which arose at the bidding of his word. And again, the mode of imparting the living principle, "*he breathed into his nostrils the breath of life, and man became a living soul,*" is marked with the same distinction which separates man from the inferior creation. The "breath of life," the inspiration from above, the *soul*, which was to make the creature in the image of his Creator, could not be permitted to be mere life as an existence, but it must descend from above, as an emanation from the Divinity—a sentient, living, and indestructible spirit.

It is impossible to separate this conviction from the reflections which crowd upon the mind in connexion with the subject of this volume. It forms, in fact, the basis, for, until we come to consider deeply the distinction which characterised the formation of man and of the lower animals at the creation, our efforts to grasp the subject at all will be entirely futile.

In the general acceptation of the word *life*, we understand organic existence, or the antithesis of death, and in that sense we must take it as regards the inferior orders of the creation; that is, as sustaining the powers of animation and of motion, without the imperishable faculties of the soul. It has been suggested that life, as an imperishable essence, might not cease in the animal world; but reflection, grounded on the peculiarities and distinctions which mark the various points in the creation, seem to prove the certainty that animal life does not partake of that essence. It is true, not-

withstanding the miraculous and spontaneous production of all orders of things, that their perpetuation was provided for in a different manner, and that the wonderful chain of connexion and dependence was not an immediate consequence; yet that strengthens no argument, nor advances any proof that a nobler gift was vouchsafed to other than man. It is for the infidel philosopher to maintain that a God created and fashioned the world, and all that it contains, from imperishable and self-existing materials, guided and controlled in his work by the nature and properties of those materials; but he cannot, or will not, see, that where there is a power of self-existence, there must also be a power of impulse and design. Before even chaos existed, there must have been a being to have created it. The darkness and errors of paganism can alone excuse the doctrines which were taught, that the mixed elements of earth and water, brooded over by the sun, brought forth, by their own powers of production, both the animal and vegetable kingdoms. We read that "*the earth was without form and void,*" and that "*darkness was upon the face of the deep;*" and thus we are assured that the elements were barren, but "*the Spirit of God moved* upon the face of the waters,*" and then only was the quickening power felt. The grass, the herb, and the fruit-tree, yielding seed and fruit after their kind, appeared at His word, while there was yet no sun to vivify them, although they were afterwards made to depend upon it for their growth and increase.

It has been said that the comprehensive study of created Nature becomes to us a handmaid of enlightened theology, and prepares the mind for better receiving and appreciating its specific and invaluable revelations;

* מרחפת.

and our attention is particularly drawn to this view of the subject from the constant passages in the Scriptures representing the creation, and the condition of the animal kingdom especially, with the relations the Creator has chosen to maintain with them.* We see that they were subjected to the dominion of mankind as soon as created (Gen. i. 28); and vegetation was assigned for their food (ver. 30). Pairs of those genera which were to spread again upon the earth after the deluge, were preserved for that purpose (Gen. vi. 19); and when the human race was renewed, it was permitted to use animals as food (Gen. ix. 3). But a distinction was afterwards ordained, and specified portions of each class were forbidden to be eaten (Lev. xi.). Lambs, goats, and bullocks, were selected for the sacrifices of divine worship (Exod. Lev. *passim*); but their figures were forbidden to be used as sacred images (Deut. iv. 16—18). Their qualities, powers, and beauties are declared to have been specifically varied and given to them by God (Job xxxix—xli). All receive their appointed food from Him in due season (Psalm civ. 27, 28. cxlvii. 9); and are called upon to praise Him (cxlviii. 10). The ravens were appointed to feed Elijah (1 Kings xvii. 4). The locusts and destructive insects are represented to be his missioned instruments of punishment and discipline to man, when He thinks proper so to send them (Joel i. 4. xxii. 25. Deut. xxviii. 38, 42). Kindness to animals was inculcated (Deut. xxii. 4. xxv. 4. Lev. xxii. 27, 28. Ex. xxiii. 12); and cruelty reprobated (Deut. xxii. 6. Ex. xxiii. 19). In the final state of the world, the ferocious and the carnivorous will change their destructive appetites and passions, for vegetable food and gentle playful dispositions (Isaiah

* Turner.

xi. 6—9. lxv. 25). Our Saviour represents the birds of the air as fed by our Divine Parent, without any provision of labour on their part (Matt. vi. 26); and declares that the most insignificant of them does not perish unnoticed by their Creator (Matt. x. 29).

We thus see that, although references to animal life are made, comparisons drawn, instructions deduced, rules laid down, and sacrifices of it enjoined, there is nothing in the whole of Sacred Writ which bears the slightest affinity to the imperishability of the spirit, as mentioned so beautifully and forcibly in the book of Ecclesiastes, xii. 7.

"Then shall the dust return to the earth as it was; and the spirit shall return unto God who gave it."

Had the animal world been intended to have been endowed with higher properties and nobler attributes, no earthly co-operation would possibly have been entrusted with its birth; nor would the miracle of calling on one element to produce the creatures of another have been employed; for it is written, "*and God said, Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven;*" and further, "*Let the earth bring forth the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind.*"

This is decisive, and admits of no question. Material agency and secondary powers were employed in this great work, although the destination and distribution of the creatures were concurrently appointed by the Almighty fiat. Thus birds, born of one element—the water, are creatures of a second—the air, and find their subsistence on a third—the earth; for to the fowl

of the air *the green herb was given for meat* by the same decree which ordained it also as food for the beasts of the earth, and for every creeping thing. This is distinctly stated; and while it proves the divine superintendence, it also, by intimation, gives conclusive evidence of the bestowal of senses, perceptions, and instincts, on the animal race; for what but that could have urged the water-begotten fowl to seek its nourishment from the earth-proceeding herb?

In the Ethics of Aristotle it is stated that beasts and infants remember,—that is, recognise,—and that man alone recollects. These distinctions are hard to define, and to some extent the doctrine is not borne out by fact; for in animals which have been trained to any particular purpose, the faculty employed in its performance must be more than recognition, which can only apply to a tangible and material object. A dog will recognise its master; but it must be an effort of recollection which enables it to perform the tricks it has been taught, or the services it is called upon to render. Most animals recollect injuries they have received, and this cannot be recognition. The dog will recognise the person who has inflicted the injury; but there is something beyond,—an association of something more,—the recollection, namely, that it suffered ill-treatment at his hand. Memory there must be, or there would be no recognition, and what is recollection but an appeal to the memory?

These faculties are entirely distinct from instinct, which in animals is equivalent to the reason and mental power in man, teaching them the means of self-preservation, by hybernation, migration, and concealment, the periods for propagating their species, and the contrivances for receiving and sheltering their young.

Reason has an object or aim in view, founded on some mental calculation or desire; but instinct, on the contrary, is a blind impulse, which by its operations compels the animal to certain actions, and which can be modified or suited to circumstances, without depending on them. We see no trace of its existence, as in the human will, till it be called forth, and then its effects are visible; and although we can find no indication of intellectual faculties, we cannot deny that some animals possess a surprising degree of intelligence, combined with memory, purpose, and the power of discrimination. As regards memory, or recollection only, it is beyond all doubt that few, if any, animals are deficient in it; and that many, particularly domesticated ones, possess it to a most extraordinary extent. The horse does not forget the road he has once traversed, though years may have intervened; dogs, elephants, and ferocious animals in confinement, recognise the persons from whom they have received kindness, after a long separation; and some have been known to have treasured up the recollection of wrongs, and to have watched for opportunities of revenge. Among fish, both eels and carp have been taught to come for their food at the sound of a bell, and the gold fishes in their bowl recognise the hand that feeds them. Pheasants in a preserve, and fowls in a farm-yard, flock together to receive the scattered grains at an accustomed signal. All these instances are proofs of some power of combination; the birds, it is true, are accustomed to receive their food because a signal has been given to them, but let the signal be repeated often at the usual times, and no food be given, and the charm ceases. This is discrimination.

It is only among the higher orders of animals that

any trace of real intelligence can be found; and as we descend lower in the scale of creation, we see the power of free agency gradually disappear, and the impulse of instinct become the only characteristic.

The monkey tribe and the carnivorous races occupy the first rank in the scale of intelligence; then follow the pachyderms, such as the elephant and horse; afterwards the ruminants, or those that chew the cud; and lastly the rodents, as the squirrel, the marmot, the beaver, the hare, &c.;—which, with the exception of a few solitary instances, are unable to distinguish particular persons, although they receive their food from their hands. The ruminating animal, however, has that power, but it is of so limited a nature that a change of dress prevents his recognising his keeper. A buffalo, in the Garden of Plants in Paris, was extremely docile to his keeper, till he ventured near it one day in a dress different to his accustomed one, when the beast ran furiously at him, and he with difficulty saved himself, but having resumed his ordinary apparel, the animal became immediately submissive.

The elephant and the horse not only recognise individuals, but are easily taught to obey certain signs; the dog shows its sense of kindness, participates in the feelings of his master, deprecates his anger, and is ready to obey and serve him at a signal. The monkey is endowed with greater powers of discrimination, and acts with more calculation than the former races; but these qualities are short-lived,—they are fully developed while it is yet young, and fail rapidly as it gets old.

In the lower order of animals all traces of intelligence seem to disappear, and are supplied by a wonderful instinct, which directs all their actions; but still some

insects appear to possess on some occasions a power of judgment which is independent of instinct, as the necrophori, or burying sylphs, which, to reach the dead animal fastened on the top of a stick, bring it to the ground by undermining the stick; and the ant, of which Mr. Turner gives the following instance:—he saw an ant drawing out of her nest under a grass-plot, a small straw with her mouth. She came up backwards. When on the level ground, she turned, and holding it in her mouth, pushed it before her. When the short grass hindered or stopped it, she turned quickly round, and went through the obstacle backwards with it, till she had got through the difficulty, then turned round to go forward as before. When another bunch checked it, she turned again, and went backwards through the obstruction. It was all done with correct and instantaneous judgment. Dr. Darwin relates, that he saw a wasp with a fly nearly as large as itself. Having separated the tail and head from the body, it rose with this in its paws, but a breeze catching the fly's wings turned them round. The wasp then descended on the gravel, and cut off with its mouth the two obstructing wings, and then flew off with the body. Reaumur describes a sphex cutting away the legs and elytra of a cockroach that was too big for its hole.

It is easy to account for many peculiarities in animals from their resemblance to properties which we ourselves possess; but there are still others which we cannot by any means fathom, and which lead us to suppose that many of these beings are endowed with an additional sense or faculty, of whose nature we are unable to form the slightest idea. Instinct impels the swallow to migrate, but it must be another power which enables it with unerring certainty to return to its former haunts.

Pigeons, conveyed to a distance of two or three hundred miles in a closely shut basket, naturally take the wing on being released, but they also return to their homes with a velocity which is a sure index of the certainty of their point. Local attachment may be the reason, and although that is a surprising principle of action, yet there remains the mysterious faculty of satisfying it to be explained. If we go a step farther and instance dogs and cats, which have been known to have travelled immense distances back to the places from which they have been carried, we find deliberate purpose and design, an arranged plan which no obstacle can stop nor hardship daunt. This cannot be called instinct any more than the astonishing power of the North American Indian to thread forests, and to reach points where his foot had never before trod; yet both he and these last-named animals will be found to have travelled to their destination with almost the precision of a compass.

Combined with instinct there must be another quality as wonderful as unfathomable, which influences the actions of insects. It is not possible for them to see their produce, and without some implanted knowledge they cannot know what creature will proceed from their eggs; they have no experience of seasons, and yet in the northern hemisphere they act with the most perfect anticipation of them—covering their eggs, either with a kind of varnish, or with the hair from their own bodies, as a protection from the cold,—while in the southern, this precaution is dispensed with. Again, in numberless cases the food of the mature insect is totally dissimilar to that requisite for the future larva, and thus the discrimination which can select that plant which is adapted to its nourishment, is one of the deepest mysteries of

nature. The female of the necrophorus lays its eggs on the carcase of a mole or other small animal, which is its own food also; the butterfly, feeding promiscuously on the sweets of flowers, fixes exactly on that plant or tree which alone produces the fitting food adapted for its own peculiar species; and the wasp, the plunderer of honey and sweets, fastens up in the cell of each of its future larvæ small caterpillars. Instinct doubtless prompts this extraordinary operation, but perception alone can guide the insect in the selection of the proper object.

From carelessness in not watching the impulses of the animal world with sufficient attention, and from the habit of generalising them, and imputing every peculiarity to one source, the passions of animals, and their various faculties—for they are endowed with many—are too often ascribed to instinct, which is the cause, but not the effect. We know nothing of the cause of the presence or of the absence of any peculiar intellectual or instinctive faculty in any animal, and as little respecting the principle which gives it the power of exhibiting it; we only know that it is by the agency of the nervous system that any outward development can be manifested. Science is totally unable to trace the connexion which exists between the operations of the brain and the conceptions of the mind, or the affections of the senses, although there is not the slightest doubt of the brain being the special instrument by which the powers of the mind are directed; for, as the brain is the seat of every impression made on the external senses, every sensation of the mind must have its source in that organ, and thus the expression of our will, and the employment of our faculties, must be dependent on it. If, from any circumstances, its functions should be

interrupted, we lose the powers of the understanding, of the will, of the senses, and even of consciousness, and are reduced to a state of mere organic existence. This is incontestably proved by the effects of apoplexy, and even by an external blow, which paralysing the functions of the brain, throws us into a state resembling the deepest sleep; and by experiments made on the higher orders of animals the same results have followed, showing that any injury to the brain deprives them equally of the power of instinct and intelligence. But although we are thus certain that the agency of the brain is essentially necessary to the workings of the intellectual powers, we are not to conclude that this organ can feel, think, and will of itself; for it is not within the range of possibility to conceive how a material substance can exhibit properties like those of the mind, and thus all the hypotheses of materialists are irreconcileable with, and opposed to, reason. In proof, or in explanation of this, we must look higher, and at once ascribe the power to an immaterial principle, which in man is termed the soul, or the principle of life. We find ourselves bound to acknowledge that this power is the first cause of all the phenomena necessary to our existence, and whose natures can only vary because the organs or parts, by whose means their power is demonstrated, are different in the several species of animals. We are entirely destitute of all facts which can explain the question; and even physiologists are ignorant what degree of analogy exists between the soul of man and the principle of life, as equivalent to the soul, in animals, and which appears to possess almost as many and as various attributes as there are species. But however this may be, we know that the brain alone is the instrument of any operation of the mind, and that

the formation of every physiological organ is in perfect accord with it. It follows hence that we can decide *à priori* that the cerebral system, as the agent of every active faculty of the mind, must undergo a certain change according with the ideas formed in man, and the different degrees of intelligence by which animals are influenced; and indeed anatomy seems to decide this extraordinary harmony, and to leave no room for theoretical arguments.

To reason by analogy, we know that the more any organ is developed, the greater are its powers; and thus it is natural to conceive, that in proportion to the development of intelligence, the material development of the brain must equally follow. Man, who is raised by his intellectual powers above all other creatures, has a more perfect organisation of the brain; in monkeys, and in carnivorous animals, it is less expanded, although it possesses a remarkable degree of perfection; it is smaller, and less complicated in its structure, in the rodentia; and sinks to its minimum in fishes, which hold the last rank in the scale of vertebrated animals.

These facts have given rise to the idea that the different degrees of intelligence, both in men and animals, may be estimated and ascertained according to the development of the brain; and in order to reduce these principles to a system, different methods have been had recourse to, of which perhaps the most important is that of the measurement of the angle of the face, suggested by Camper, a celebrated Dutch naturalist. Among all creatures, man is distinguished as possessing the greatest angle of the skull; but the most extraordinary distinctions prevail even in this respect between the different varieties of the human

race; the head of an European, for instance, showing generally an angle of 80°, while that of a negro has only 70°. Among the varieties of the monkey tribe the difference is still greater, as it ranges from 65° to 30°, and in proportion as we descend in the scale of creation, the greater do we find the angle. The foreheads of the horse and of the wild boar recede to that extent, that it is not possible to draw a straight line from the farthest extremity of the upper jaw-bone to the skull, on account of the prominence of the nose, birds, reptiles, and fish, have the angle even more acute than the mammalia.

Amongst the uncivilised races of man, whose pursuits and habits of life, besides the fact of an inferior organisation, are opposed to any great intellectual development, the senses possess an extraordinary power, and compensate largely for that deficiency—the one being either dormant, or little capable of impressions, while the others attain a surprising degree of keenness and susceptibility, as essential to self-preservation and the means of sustenance. Thus, then, the inferior orders of our own species are but little exalted above the lower animals, which, as far as we are able to judge, are entirely occupied with the objects of their present perceptions. Aristotle remarks that outward perceptions—that is, the impressions upon the senses—are the objects only of the sensitive part of the mind; but by various internal powers, which may be called the internal senses, they are fixed, refined, and so embodied as to become objects of memory and imagination, and form in fact the intellect.

This, however true, is not the only cause of action in the will or intellect, which becomes strongly excited by some inward perception or craving even among the

lower animals. A dog, losing his master, must have some perception or idea of his position, or why does he search for him? Self-hunting dogs, stealing from their kennels, and following their sport privily, must experience a sensation, and hence have a perception of some impulse acting upon them, which they obey. There is a notorious instance on record of a dog, which slipping its collar at night, roamed round the adjoining fields and worried the sheep, and afterwards washing its jaws in a stream, returned home, re-adjusted its collar, and keeping within its kennel, threw off suspicion. Here we have not only impulse, but also a multiplication of actions arising from inward power and intelligence, unaccompanied by perception, or the operation of any outward agency. An orang-outang, in Paris, when left alone, always tried to escape, and as he could not reach the lock of his door, he carried a stool to the spot, which being removed, he took another, and mounting on it, renewed his efforts. Reason only could have prompted this act; and, besides, there must have been a combination of ideas to have enabled it to get the stool to assist itself in opening the lock, to copy what it had seen its keeper do, namely, to unlock the door, and to move a stool about as it wanted it.

The faculties of the senses in the animal world appear to be so perfect, and so impossible of further development, that the loss of any one does not, as far as we can judge, add any strength to the others, as in the human race. A person who accidentally loses his sight, never fails to improve gradually in the sensibility of his other organs, particularly in that of the touch, which can only arise from one of two causes—either that in the loss of one sense some change takes place in the physical constitution of the body, so as to

improve a different organ of perception, or that the mind gradually acquires a power of attending to and remembering those slighter sensations of which it was formerly conscious, but which, from our habits of inattention, made no impression on us.

Savages, whose minds are almost wholly occupied with external objects or particulars, and who have neither the inclination nor the capacity for general speculations, are often observed to employ a long train of means for accomplishing a particular purpose. Something of this kind, but in an inferior degree, may be remarked in animals; and that they do not carry it further is probably the effect of the imperfection of some of those faculties which are common to them with the human species, particularly of their powers of attention and recollection. The instances that may be adduced to prove that they are not destitute of reason, are fully borne out by the various contrivances they have recourse to to gain their ends. M. Bailly, in his *Lettre sur les Animaux*, recounts the following anecdote:—"One of my friends, a man of great talent and veracity, related to me the following facts, which he himself witnessed. He had a very intelligent monkey, with which he often amused himself by giving it nuts, of which the animal was particularly fond; and once especially, when he had placed some beyond the limits of its chain, so that the animal could not possibly reach them, and was watching its efforts and manœuvres to get at them, a servant passed by with a napkin under his arm, which the monkey immediately seized and employed to drag the nuts within reach. His mode of breaking them was an additional proof of sagacity; for, laying them on the ground, he split them by striking them with a stone; but on one occasion, when the

ground was wet from rain, and the blows only drove the nut into a hole, it took a piece of wood, on which it laid the nut, and then broke it."

Sensation arises from the same causes in both animals and man; but the local ones of pleasure and pain, as well as the specific action of the senses, seem to be less developed in the former. We are only able to decide in the few cases where a different organic construction visibly exists, as in the formation of the eye in insects and crustacea, whether any individual sense, as part of the nervous system, differs from that of man. It is obvious that the chameleon, which has the power of directing one eye upwards and the other downwards at the same moment, must have a different sense of perception, and receive a different impression, from the being whose two eyes embrace only one object in their vision; but we may, with some degree of certainty, assume that the impression made by the senses is less keen and lasting than in man; and that thus the animal may be said to receive only passing sensations, while in man they furnish ideas, fix the attention, and strengthen and improve the mind, in which they become indelibly imprinted. Even in man there exists a very great difference in the impression made by the senses on the mind; one perceives readily all the distinctive shades of a colour, another the variations of a sound, so that each, to an equal extent, and without any previous trial of the respective organs, receives a different impression on the mind, each being the more forcible with one than with the other. This is more remarkable when we compare animals, either together or with man. The dog, as indeed most other animals, possesses a keener and more exquisite organ of smell than the human species, certainly than the civilised races; but

his powers of sight and hearing are not often so perfect. But if it should hence be argued that man is infinitely behind the animal both in the quality and extent of his organs of sense, still it is clear that the animal, as regards their application, stands in a much lower scale than man. Pierquin, in his "*Traité de la Folie des Animaux*," places the senses of quadrupeds in the following order: smell, taste, sight, hearing, touch;—of birds: sight, hearing, touch, taste, smell. It would have been, perhaps, more correct to have made the taste a secondary object in both classes, and to have placed the sense of smell before that of touch in birds; but still it must be obvious that no rule can be laid down, as the cat, for instance, cannot follow the scent like a dog, and besides a great difference of power exists among animals of the same species, as among dogs, of which some hunt their game by the sight, and others by the smell. If, however, the animal really experiences the same lively and keen sensation as man, there is a vast difference in the effect and in the durability of the impression made by them. The bird of prey has a more piercing sight than man, but the action produced on the retina is of an evanescent character, excepting in such objects as are permanently fixed in the sense, as being essential to the existence and habits of the bird. Thus the eagle embraces a whole landscape in its vision, as it floats high in the air, but nothing interests it in the survey beyond the prey crouching with instinctive dread. Flemming even asserts that the dog and the falcon receive each a different impression at the sight of a hare; and if so, it must be the same with all animals, for it is not the keenness of the sight which gives character and tone to the idea, but rather the degree of power which stamps the picture on the mind.

Darwin instances this by the circumstance of a partially deaf child, which could readily remember airs in music; and the principle is besides most satisfactorily proved by comparing the powers of a savage with those of a civilised being. Pritchard says that the Calmuks can tell, by their sense of smell, whether a fox is in his earth or not, and adds many proofs of their equally great power of sight, as illustrative of his theory that most of the senses, particularly that of the smell, become blunted in proportion as the intellect becomes more developed. But this, however true in some respects, cannot apply generally, as in some instances, particularly in animals, the diminution of power arises from other causes. The sense of security, and the dependence that domesticated animals place in their masters or guardians for protection and the supply of their wants, naturally subdue the keenness of those organs which would be otherwise essential: and again, in some cases there is an absolute suspension of them, or rather a want of faculty to employ them, as in the bird, which, having escaped from its cage, is totally unable to provide for itself, and perishes from hunger, demonstrating evidently the fact that some other quality besides instinct is necessary to enable it to search for its food; for instinct is not dead within it, as the same bird, if provided with proper materials in its cage, will attempt to construct a nest similar in every respect to that of the same species in a wild state. Semi-domesticated, or reclaimed animals, living in a state of comparative freedom, seem to possess but a very limited degree of their native intelligence; or, phrenologically speaking, it is so counterbalanced by other acquired properties, that it becomes a new power of action. In Greenwich Park the small herd of deer roam about

unmolested by the numerous visitors, and even feed from the hand; but on Sunday, when the park is always particularly thronged, they confine themselves to an enclosure devoted to them. This, to say the least, is a remarkable faculty in the computation of time, an artificial acquirement arising from a still remaining feeling of the natural caution and distrust of the animal. In the Prater at Vienna, a park of vast size, and unenclosed at its entrance from the city, a magnificent herd of about eight hundred red-deer range at large. Many of them, also, habituated to the presence of the people, take bread from the hand, and, as if free from all natural timidity, frequently wander forth in small parties during the winter nights of intense cold, and boldly take shelter in the court-yards of houses in the suburbs. Here is an absence of all sense of danger, the antithesis of its natural habits, in an animal, which, timid at all times, is in its wild state jealous of the slightest intrusion, and whose organ of smell is so keen that it is difficult of approach excepting by stratagem. Instinct may teach it to fly for preservation, but perception, or the exercise of some faculty called into activity by some outward impression, can alone warn it of danger, or teach it the proper moment for flight.

A better perception can probably be formed of the extraordinary powers and capabilities of the animal world, if we examine each sense and faculty separately, and thus gather the proof of their operation on the animal intelligence, as an anatomist would show the perfection of a whole by the relations of the separate parts to it.

PERCEPTION

Is the impression of things caused on the mind or internal senses by some outward organ, like the reflection of a figure in a looking-glass; and it is only by this outward process that the senses can act on the reasoning faculties, and then only by the co-operation of the nervous system. Thus the senses are the medium by which the mind is brought in contact with the material world: they are as lights to the body, and, like a luminous curtain, intervene between the mind and the outward world. Through them the mind perceives the existence of objects, and the varieties of form, colour, and sound.

The organs of the senses are chiefly deep seated, protected by surrounding parts, and provided with numerous nerves, which are so connected with the central organ, the brain, that any affection of them operates immediately on that centre. The proof of this connection, as before stated, exists in the fact, that any pressure or injury of the brain either suspends the power of the senses, or, by distortion, destroys their balance.

The perception of external things is common to the whole animal world. Like the aurora borealis in the darkest night, it glimmers only in the lower orders, but becomes brighter and brighter at each successive step, till it attains full lustre and vigour.

In the lowest scale of life, where neither nervous system nor organs of sense are developed, and where no brain exists, powers of perception are manifested. They are connected with no organ, but extend over the whole

body; in fact, the entire surface is an organ. It is thus that the trumpet animalcules and the polypi seek the light. When the glass in which they may be placed is entirely darkened, or is exposed to an equal light, no difference is perceptible; but if the glass be partially shaded, they will both turn to the light. It is obvious that no individual part, but that the whole body of the polypus possesses this sensibility, for if it be divided, both parts will equally seek the light.* The same polypus can distinguish at a distance of six or eight inches the animalculæ on which it feeds; it perceives the motion made by them in the water, and creating a little whirlpool, it drags them within its reach, and seizes them with its tentacula.

It is not possible to determine in this and similar cases to what extent the power of sensibility acts; as in their earliest stages, in the first glimmer of their existence, perception and sensibility seem to be grafted together. It has been satisfactorily proved that the polypus cannot see its prey, but is only aware of its presence by the actual agitation of the water, from its remaining altogether passive when a thin piece of glass is interposed between them. There are many Monades, which, without possessing any trace of an eye, are yet susceptible of light.† An equally extraordinary phenomenon presents itself in the Proteus anguinus. This singular animal is found in the subterranean lakes of the interminable stalactital caverns in the limestone range of the Carniolian Alps, where the author saw it. In appearance it is between a fish and a lizard; it is of a flesh-colour, and its respiratory organs, which are connected with lungs, so as to enable it to breathe above or below

* A. Trembley: Mémoires sur les Polypes.

† Schmarda's Treatise on the Effect of Light on Infusoria.

the water, form a red crest round the throat, like a cock's comb. It has no eyes, but small points in the place of them, and light is so obnoxious to it, that it uses every effort to exclude it, by thrusting its head under stones. It is reported also to exist in Sicily, but is known nowhere else.

Those persons who have had the opportunity of seeing Infusoria through the medium of a powerful microscope, must have noticed how many of them, as the Vorticellæ, fold themselves up on the slightest agitation of the water, and how the Ophrides and several of the Rotiferæ retire into their sheaths, or contract their steering membranes, on the approach of any foreign matter. In short, there cannot be the slightest doubt that these animalculæ, however dark and confined their little world, possess the power of perception. The incredulous, before he condemns, must reflect that though imperceptible to his naked eye, they show, under a magnifying power, the most beautiful and delicate forms, and that the hand which created them could equally supply them with organs and powers of senses.

THE TOUCH

Is the lowest, but the most extensively diffused of the senses. In the absence of every other, it still holds its place, and may, in fact, be considered as the universal sense. Its seat is in the skin, extending over the whole surface of the body, forming the chief medium by which the mind or spiritual existence comes in contact with the outward or material world. By its means the animal is made aware of the nature of space, size, form, extent, of

hard and soft, of even and uneven, and ascertains both the weight and temperature of foreign bodies. But besides this universal quality of the skin, in which, among the higher classes of animals, a net-work of the minutest blood-vessels and nerves spreads itself, forming in places little prominences, or papillæ, we often find separate parts (tentacula) which, like an elongated membrane of the skin, are endowed with the most delicate sense of perception, and in which a higher power of sensibility seems to reside.

Thus the eyelashes, the proboscis, the neck-shaped and lip-like extension of the dorsal parts in the Infusoria; the tentacula, or feelers, in the Polypi; the sea anemones; the star and cuttle fishes; the tube-like feet in the star-fish and sea-hedgehogs; and the horns and feelers in certain worms, snails, spiders, crabs, and insects, become peculiar organs of sensation. These organs play a most important part as regards the means of perception and intercourse among insects. Latreille relates that having deprived several honey-bees of their antennæ, he placed them close to their hive, and that they crawled about in all directions, as if unconscious where they were, or of what they were about. The lips and snouts of fish are furnished with numerous nerves. Snakes, from their peculiar bodily construction, have the perception of touch highly developed, for, from the great flexibility of the spine, they can seize and wind themselves round all objects, and make themselves acquainted with their nature; and hence, doubtless, arose the saying, that "their body is their hand." The prehensile tail of the lizard tribe, of the chameleons and geckos, and of some species of monkeys, is a powerful instrument of this sense. Even the thick and apparently insensible skin of these animals has a clear

perception of touch; and it has been remarked* that the lizard, notwithstanding its scales, is immediately aware of a fly settling upon it. Among birds the point of the bill is a delicate organ of touch, but it is most strongly developed in the waders and swimmers. The bill is covered with a fine membrane, which possesses the nicest power of discrimination and sensation, and enables them to seek their food deep in the mud, where its presence is alone detected by the touch. The toes, also, furnished with a kind of wart-like process, possess the same property to a great extent.

Among the Mammalia, the lips, the extremity of the nose, and the bristles surrounding it, exercise the principal functions of the touch. The shrew-mouse and the mole, to suit their peculiar habits, have the nose singularly elongated, with the power of moving it; and as the eyes of the latter are extremely small, the nose is a substitute for those organs. But among the Pachydermata, the nose possesses even a more exquisite degree of power. In the swine and the tapir it begins to assume the character of the proboscis, which presently, in the elephant, becomes so perfect an organ, that it is equal to all the functions of the hand. Its sensibility is so refined, and its perception so nice, that it can discriminate between objects by the merest touch; and the preservation of this faculty by the animal seems to be of such vital importance, that its constant care, in moments of exposure or danger, is to guard the organ from injury. In tiger-hunting especially, when urged to the charge, or anticipating an attack, it curls its proboscis backwards over its head as a protection. The rhinoceros has a soft, hook-shaped apophysis on the upper lip, which, being always

* Duges.

moist, is endowed with the keenest susceptibility. The whiskers of the Rodentia, the feline tribe, and the seals, possess a most remarkable degree of sensibility, particularly at their roots. A rabbit deprived of these and having its eyes bound, could not extricate itself from a passage formed of books piled together without coming in contact with them; and the same animal, uncurtailed of these necessary appendages, pursues its course in its burrow with unchecked rapidity. Cats also lose the faculty of mousing from the same cause, every separate hair being a feeler of the most delicate power of sense. Bats have an equally surprising degree of consciousness in their membranaceous wings and ears. One, which Spallanzani deprived of its sight, pursued its flight without interruption, keeping in the middle of narrow crooked places, avoiding strings stretched across the room, and selecting places to settle on; but deprived also of its ears, it flew about without having the power of directing itself.

The prehensile tail of the American monkeys is very similar in its use to that of the tree-climbing lizard. The surface is abundantly furnished with little wart-like excrescences, covered with a skin as fine as that of the hollow of the hand, and is as susceptible of touch, and of the nature of objects, as the hand itself.

The organs of touch serve in many instances equally for the purposes of motion as for the catching of food. In the Polypi and Cephalopods, the many-jointed tentacula, placed in conjunction with the organs of digestion, seize the food, nourish the body, and assist its motion. The connection between the organs of deglutition and touch in snakes, is an additional phenomenon, for it has been ascertained by Hellman that their forked tongue is peculiarly serviceable for the latter purpose.

They reconnoitre things by a brandishment or vibration of the tongue, without immediately touching them, and come to the perception of stationary objects most probably by the pressure of the air, for their sight and smell are extremely weak.

The tongue of the woodpecker, elongated and furnished at the tip with a kind of bristly process, is remarkably sensitive; for when thrust into a hole in a tree, it is instantly aware of its contact with an insect, however small, and is withdrawn with the insect cleaving to the point.

TASTE.

By means of the organs of taste and smell, animals discriminate between the properties of bodies, especially of those which partake of the nature of food. They are situated in the spongy, moist skin which surrounds the mouth and the nostrils, parts which are so exquisitely tender that any application of force to them is sufficient to subjugate the most untractable animal. A ring passed through the nose of a fierce bull, and checked by a cord, coerces him at once; the twitch twisted round that of a vicious horse, compels it to remain quiet; and the wire riveted through the snout of a pig, prevents it from grubbing up the earth. That the sense of taste is conducive to the enjoyment of animals, is obvious from the eagerness with which they seek after and devour some things, while they pass by others, or only touch them when driven by hunger, and positively refuse others altogether. Their sense of perception is so acute, that with the exception of the leaves of the yew, which apparently have some attraction, and are fatal in their effects,

they never touch anything of a poisonous or baneful nature. But it is highly probable that the sense is the most highly developed in those animals furnished with a tongue and salivary glands, although a great discrimination is shown by some of the inferior classes, as the leech, which sucks greedily sweetened water, and in medical cases operates more efficaciously on healthy than unhealthy patients.

Insects which are furnished with either salivary glands, a tongue, or a proboscis, have probably the faculty of taste in one of these parts; but many have, besides, a pair of short horns or feelers immediately behind the antennæ, which are in perpetual motion, in feeling and examining the substance on which the insect may be feeding, and hence many entomologists have decided that they are the actual organs of taste.

The tongue and gums of fishes are gristly and hard, the latter being generally densely crowded with teeth, and are, as in reptiles, hardly capable of all the refinement of taste; and, in fact, where food is swallowed whole, as with fish, and in an entire state, by convulsive efforts, as with serpents, the power of taste must be extremely limited. Ruminating animals, although they show a stronger partiality for some roots and grasses than for others, and thus have a præ-taste for them, experience the greater gratification of the taste in the second process of chewing the cud.

SMELL,

As we have seen, is in close connection with, and indispensable to, the foregoing sense; but its power and utility, far from being limited to that one end, are so

essential to the existence and necessities of animals, that its development, exceeding by so much that of any other sense in delicacy and susceptibility, is among the greatest phenomena of animal life. Its object is to distinguish effluvia (evaporation or particles of the minutest description), which, light as the air itself, spread themselves with instantaneous rapidity over an extensive range of atmosphere. It is most probable that all animal and vegetable bodies give out these infinitesimal particles to a most abundant degree, but our organs are too blunt to detect them, although the savage races and animals perceive them immediately. The North American Indians can not only detect the presence of man at a great distance, but can distinguish with certainty between white men and those of their own race. Camels passing through the desert can scent water at the distance of two or three miles, and rush to it in the straightest direction, and the cattle in Paraguay wind it even still further. Humboldt says that travellers in South America, when in extremity for water, abandon their mules to their own guidance, which immediately go in a direction against the wind, stopping from time to time, and sniffing the air, till they have satisfied themselves of the point where water is to be found, towards which they hurry, snorting and neighing with impatience. Delicate indeed must be the organs which can distinguish the evaporation of the water (for such is doubtless their guide) at so great a distance, and in so heated an atmosphere!

The seat of this sense is in the nostrils, which in mammalia, birds, and amphibiæ, communicate with the mouth, and in all animals possessing great powers of scent, the orifices are peculiarly large, with many internal convolutions; in fish they are small, and termi-

nate abruptly, and although no distinct organs have been discovered lower in the scale of life, as in snails, crabs, carrion beetles, bees, and other insects, yet it is evident that they scent their food at an amazing distance. Lefebore declares his experiments to prove conclusively that the faculty of smell in bees and wasps lies in their feelers, for on the removal of only the last joint of them, it is entirely lost—Burmeister places it in the salivary gland.

The edible snail (*Helix esculentus*), which is kept in vast quantities in Italy and other parts of Southern Europe, comes forth to feed directly herbs are thrown into its pits. Lenz says that the wood-snail may be attracted by fat, and that as it withdraws its horns previously to touching any strong smelling substance, they are susceptible of smell, and consequently are the organs of that sense. Schmarda made various experiments with the edible snails, and ascertained that the lower pair of feelers are keenly sensible of odorous substances. He placed near them camphor, oils of juniper, turpentine and petroleum, æther, &c., when they immediately drew in their horns, and if the scents were particularly strong, the action of withdrawal was more instantaneous.

As it is beyond all doubt that insects are attracted to and distinguish their food by the power of smell, it is also most probable that they select the proper objects on which to deposit their eggs by the same faculty. Hardly is a dead mouse thrown into the garden, than the various carrion-beetles are busy in burying their prey. Leuret states that not being able to discover under the flooring of a room a dead rat, whose effluvium was most offensive, it occurred to him to put some flesh flies into the room, which flying direct to the spot,

discovered its position. Honey exposed in an open place will attract bees from a considerable distance.

Fish are quickly decoyed together by strong smelling matters thrown into the water, and fishermen are often in the habit of making their bait more attractive by steeping it in essential oil, and other powerfully smelling ingredients. According to Bell, the fatty glandular substance from the under jaw of the crocodile, which is strongly impregnated with musk, is a very effective bait for fish. People bathing in the ocean, far from the sight of land, and out of all soundings, have often been surprised at the appearance of sharks, when none had been visible previously from the mast-head of the vessel.

Among birds, the predatory classes are endowed with a keener sense of smell than the granivorous tribes; but still it has been satisfactorily proved that it is not so exquisite as has been supposed, and that they are dependent on the sight for the discovery of their prey. Audubon stuffed a deer's skin with hay, and placed it in an open field in the attitude of a dead animal. A vulture soon made its appearance, and perching on the stuffed skin, began to tear it open with all its force, but finding that it only drew forth grass, after continuous efforts, it abandoned its attempts with evident reluctance. Young vultures in confinement give no signs of perceiving the presence of their food, however near it may be placed to them, unless they actually see it, as proved by Bachman; and thus also herons and other waders are guided by the sight to the selection of the best supplied fishing places.

Most animals, on the contrary, have a most extraordinary faculty of smell. A dog traces his master and pursues game entirely by the scent; a horse winding a

lion, at the distance of a hundred paces, plunges and becomes unmanageable; and in a wild state, jealous of the least intrusion on its haunts, it posts a sentinel for the protection of the herd, which scenting the approach of man from far, gives the signal for flight. Horses accustomed to one groom, and refusing to be attended to by a substitute, have been deceived by the stranger dressing himself in the clothes of his predecessor. They smell at each object with which they are brought in contact, and regulate themselves with respect to it, according to the impression they then receive. Herbivorous animals distinguish in the same manner those plants which are their appropriate food; and the faculty of perceiving animal substances by the smell is peculiarly powerful in the carnivorous classes, which is exactly the reverse with birds of prey. Audubon concealed the carcase of a hog, in the month of July, at the bottom of a deep ravine in one of the Southern States of America, where corruption is almost instantaneous; several vultures passed over the spot without perceiving it, although the effluvium was so strong that Audubon found it unbearable at a distance of forty yards; but the dogs soon winded it, and consumed a great portion of the flesh. Dogs, like pigs, scent truffles in the earth, and such as know their taste, from having had them mixed in their food, seek for them and scratch them up with avidity. Cats are attracted by the smell of valerian, and rats by essential oil, particularly by rhodium. Animals in general perceive their most dangerous enemies by the smell, and thus a fox will not go near its earth for many days, if a terrier has been in it. Sheep, when fresh shorn, are not recognised by their lambs, which run hither and thither, attracted by the well-known bleat, in confusion at not seeing the

accustomed form till they identify it by the smell. Bloodhounds, if put on a scent, will follow it with unerring certainty; if of a man, through the crowd and confusion of a market-town; and if of an animal, particularly a wounded one, into the herd in which it may have taken shelter, without being baffled by the scent of the surrounding beasts.

Animals follow in pursuit either by the power of the actual scent itself, or by the trail left on the earth in the passage of the flying object. Thus hounds run breast-high when the scent is hot, and puzzle anxiously along the ground when the surrounding air no longer supports it. The faculty consists in the attempt to distinguish the various essences floating in the atmosphere, to which end the animal turns his nose to the wind and inhales strongly: it would seem to be a sense of enjoyment, as in the case of the pointer, notwithstanding education has brought all his powers in subjection, yet the inflation of the nostrils and the tremulous movement of the jowls, when he is in the act of setting game, are highly remarkable. The stag can scent a man at the distance of several hundred paces; and Scoresby relates that the polar bear climbs the icebergs and winds a dead whale, and even a lump of the cooked flesh, at many miles away.

The trail is peculiarly that scent which is communicated to the earth or other substance by the touch of the animal passing over it, and was supposed to have been discernible only by animals of the carnivorous species; but it has been satisfactorily proved that most of the other families possess the faculty. Hares have been seen to track each other by the scent. Hounds running with their noses to the ground are led on only by the trail, and often pass close to their game, which

has doubled back almost on its former track: the gaze-hound, on the contrary, is guided entirely by the view, which once lost is not to be recovered. In coursing once with a pair of very fine dogs which had gained several prizes at Swaffham, the hare, being hard-pushed, took a maze through a strong quick-set hedge, which the dogs topped almost at the same instant and together; the author was close at their heels, and found them at fault, straining their sight in every possible direction, instead of being in full chase. He was as much at fault as the dogs, as it was not possible for the hare to have distanced them; and, on examination of the spot, he found the hare dead in a wire which had been set in the maze in question, with its neck broken by the violence of its impetus. Had the dogs possessed the least nose, they would have scented the hare, which lay within two or three yards of them. It is not one of the least surprising points in the economy of nature, that where there is great speed, the powers of scent are in proportion subdued. The fox and most dogs can hunt by scent, as if in view, as well as by the trail.

HEARING

Is the conscious sensibility of the vibration of the air; a sense of perception different from that of the touch, inasmuch as it does not operate by a strong, visible, and continuous effect, but by a gentle and rapid impression on a certain organ, which is the peculiar seat of the sense, although the whole body possesses the same sensibility to a limited extent. Thus partially deaf people

are conscious of sound by bringing some part of their body in immediate contact with that emitting the sound, as by placing the hand on a musical instrument; but that faculty, as proved by Swan, is destroyed by tying a bandage tight round the arm, and thus deadening the nerve. Deaf and dumb people are aware of the approach of a carriage, and even of a footstep, by a slight vibration of the nervous system, occasioned by the earth serving as a conductor to the sound; and in the same way they feel the slamming of a door in a distant part of the house: many also experience a strong palpitation of the heart at any sudden and violent concussion of the air.

It appears to be certain that among the lower orders of animals, whether aquatic or otherwise, the sense of touch substitutes mostly, if not entirely, that of hearing, as the medium of the element in which they live not only conducts but increases sound. Worms retire into the earth when alarmed by any noise occurring close to them, and the Pholades, stuck into a stiff marl, withdraw their feelers and close their shells if the ground be struck only slightly, proving that the faculties of hearing and feeling are closely assimilated in such cases.

The simple organ of sound resembles in appearance a small bag or bladder, in a moist state, and thickly beset with nerves, connected outwardly with a tightly drawn parchment-like skin, and protected by cartilaginous membrane. In this state the perception of sound actually exists; but it is only when more highly developed that the distinctions and properties of sound can be distinguished.

The first trace of an apparatus is found in animals of the crab species. The lobster has at the root of its feelers

small holes, which terminate in a purse thickly furnished with a quantity of fine thread-like nerves, constituting the organ; this approach is guarded by the shell on all sides, excepting at one spot where it is protected by a membrane. Spiders hear with great acuteness, and it is affirmed that they are attracted by music. Disjonval relates the instance of a spider which used to place itself on the ceiling of a room over the spot where a lady played the harp, and which followed her if she removed to another part; and he also says that the celebrated violinist Berthome, when a boy, saw a spider habitually approach him as soon as he began to play, and which eventually became so familiar that it would fix itself on his desk, and even on his arm. Bettina noticed the same effect with a guitar, on a spider which accidentally crossed over it as she was playing.

Spry and others state that the snake-catchers in the East Indies have the art of enticing snakes from their concealment, by a kind of song or humming sound; and Neales affirms that he tamed rattle-snakes by music, amd, however dangerous they might be, he completely subdued them; which is confirmed by Chateaubriand, who saw the anger of one of these reptiles entirely soothed by the tones of a flute. Lenz, on the other hand, describes these as mere fables, as in no instance could he ever succeed in making any impression on a snake by music, but he cites the instance of a goose which followed a harp-player whenever he performed. Bechstein says that mice are attracted by music, and Bettina noticed the same in running up the gamut. An elephant in Paris, within hearing of a concert, expressed, by its gestures, its pleasure at some pieces, while others did not affect it. Some dogs are singularly excited by

music, and accompany it with a distressing kind of howl. It is known to sportsmen that the deer and roe listen to music; and, according to Obsonville, monkeys are attracted by it, and exhibit marked delight.

It is certain that insects are sensible of sound; for crickets and grasshoppers answer to each other's chirpings, and they may be even enticed and caught by the imitation of their note. In Italy the noise made by the chirpings of the Cicada plebeia is almost deafening, and it has been noticed that a beginning made by one individual, has been immediately responded to by hundreds. The Anobium panicum or death-watch, makes a peculiar ticking sound (whence its name), and the author has often brought an individual near him by striking his nail on the table, in imitation of its note, which, however, does not proceed from the insect, but is made by striking its mandibles on the wood.

Bees, it is alleged, recognise the voice of their keeper, and as the queen has the power of uttering a sharp note, which can be distinctly heard by a bystander, before the swarming of hive, it is natural to conclude that it is made for some object, and that it is also perceptible by the whole community. As regards the absurdity of the country practice of ringing a bell or of striking two pieces of metal together when a swarm is in the air, under the impression that the sound attracts the bees to the spot, it is hardly to be wished that it should be discontinued, for, however discordant it may be, it is yet an honest piece of rural life. Its real object, long since lost sight of, was to advertise the neighbours, in the event of the swarm taking a distant flight; for by bee-law a man is allowed to follow his swarm on another person's property, and to secure that which without a notice the other might appropriate as a lucky windfall.

The organ of hearing in insects is most probably situated in the antennæ.

Fish can hear very distinctly: carp distinguish the sound of a bell, and the voice of their keeper, when called to be fed, which the author witnessed at a pond containing some carp of an amazing size, in the Imperial gardens at Peterhof, near St. Petersburg: a similar circumstance is also mentioned with regard to the trunk-fish, in the island of Mauritius. Guana lizards are said to be enticed into traps by whistling to them.

Birds are endowed with a most susceptible power of hearing; provided most wisely as a means of preservation, with regard to their peculiar habits. Obstructed as their sight must often be, by the intervention of branches and long grass, they would otherwise fall an easy prey; but the sound of a footstep, or the snapping of a twig, excites their immediate alarm, and they insure safety by flight. Some birds not only recognise the voice of their master, but distinguish its intonation, whether as coaxing them, or as calling them to feed. But however keen the faculty in general, song-birds must yet possess a much greater development; for they not only show an ear for melody, by rising and falling in their notes, but they will even pick up an air from a flageolet or an organ. The mocking-bird of America is undoubtedly the most extraordinary proof of this faculty; for it will imitate as well the songs and cries of other birds, as the sounds of different animals. Of all birds, the owl has probably the most exquisite sense of hearing. The mere examination of the outward part of the organ is sufficient to prove that fact with certainty. Dependent on it for its means of subsistence, as enabling it to perceive its prey in the shades of evening, when its sight, however piercing, can only

enable it to seize the object, whose slightest motion denounces its presence; it sails along on its noiseless silken wing, exciting no alarm in other things, though it receives it from them.

Among mammalia the formation of the ear varies in very many cases, according to the habits and peculiar nature of the animal. The portion of the ear of the mole assigned for the cognisance of sounds passing in the air, is less perfect than those which, deeper seated, receive the impression of any sound or vibration proceeding from the earth. The beaver has the power, when diving, to fold its ear backwards on its head; and the water-shrew, for the same purpose, has three distinct flaps, which close the orifice, in the same manner that many diving and burrowing animals are furnished with flaps to the nose, by which they close the entrance to all injurious bodies. The hippopotamus, which remains for lengthened periods beneath the surface of the water, is also provided with a valve-like apparatus. Hares and rabbits, which squat close on the ground, and which might be more readily discovered were any projecting point of their bodies to be visible, fold their ears flat backwards. In all, this sense is remarkably keen, and with horses it is only exceeded by that of the smell: they hear sounds and are restless long before the rider can perceive an animal or a human being in the distance. The carrier horses in Switzerland hear the fall of an avalanche, and warn their masters of the danger, by their terror, and by refusing to advance, and even by turning in an opposite direction. The acute sensibility of this organ is somewhat obstructed by the bushy hairs which grow in the outer sheath, and thus horse-dealers cut them out from horses they have for sale, in order that sounds, striking on the nerves with

greater force, may, by exciting the animals, give them a more lively appearance.

The flight of the bat, like that of the owl, is perfectly noiseless; and its ear, equally acute, detects the slightest humming of an insect, at a distance of several feet, and while it catches such as are in flight, it touches none which have settled or are silent.

Sound affects animals in different ways: birds, as has been stated before, and herbivorous animals, are alarmed or fly at the rustle of a branch; and the same circumstance only excites the attention of the carnivorous species, as proceeding probably from some unwary object of their prey. By night the ear exercises the most important functions, giving warning of approaching danger, and governing many of the actions of the body. The least sound breaking upon the stillness of the night, under whose mysterious gloom the feelings of doubt and fear are doubly excitable, strikes with increased force on the ear, which in its sense of perception compensates to the mind for the withdrawal of sight. The dog, keenly alive to the merest rustle, distinguishes between the familiar footstep and that of intrusion, however distant. His ferocity increases with his vigilance, and he constitutes himself the guardian of the house of his master, who, confident of his sagacity, passes the hours of sleep in conscious security.* It is recorded of a dog that in the dead of night it heard a cry for help, and flying to the spot succeeded in extricating his own master, then in a state of intoxication, from a pool of water into which he had fallen. The distance was so great that there was no other means of accounting for the sound reaching the animal, than by supposing that the earth acted as a

* Jesse.

conductor to the cries which were uttered on a level with its surface, and that the ear of the dog lay close to the ground; but there is yet the remarkable point of the power of perception, which enabled the animal, perhaps, to recognise his master's voice, and certainly to distinguish the nature of the cry.

The soft and noiseless tread of all the feline race, so beautifully adapted to their peculiar habits and wants, enables them to steal on their prey without a sound or rustle to disturb their sense of security.

In all animals the outward membrane, or sheath of the ear, is most wonderfully adapted to their natures, in its construction and defences, varying in every race, and perfect in all.

Haydn relates the following anecdote with regard to the power of music:—"In my early youth I went with some other young people, equally devoid of care, one day during the extreme heat of summer, to seek for coolness and fresh air on one of the lofty mountains which surround the Lago Maggiore, in Lombardy. Having reached by day-break the middle of the ascent, we stopped to contemplate the Borromean isles, which were displayed under our feet, in the middle of the lake, when we were surrounded by a large flock of sheep, which were leaving their fold to go to their pasture. One of our party, who was no bad performer on the flute, and who always carried his instrument along with him, took it out of his pocket. 'I am going,' said he, 'to turn Corydon; let us see whether Virgil's sheep will recognise their pastor.' He began to play. The sheep and goats, which were following one another towards the mountain, with their heads hanging down, raised them at the first sound of the flute, and all, with a general and hasty movement, turned to the side from

whence the agreeable sounds proceeded. Gradually they flocked round the musician, and listened with motionless attention. He ceased playing; still the sheep did not stir. The shepherd with his staff obliged those nearest to him to move on. They obeyed; but no sooner did the fluter begin to play again, than his auditors again returned to him. The shepherd, out of patience, pelted them with clods of earth; but not one would move. The fluter played with additional skill; the shepherd fell into a passion, whistled, scolded, and pelted the mutinous amateurs with stones. Such as were hit by them, began to march, but the others still refused to stir. At last, the shepherd was obliged to entreat our Orpheus to stop his magic sounds; the sheep then moved off, but continued to stop at a distance, as often as our friend resumed the agreeable instrument. The tune he played was nothing more than the favourite air of the opera at that time performing at Milan. As music was our continual employment, we were delighted with our adventure; we reasoned upon it the whole day, and concluded that physical pleasure is the basis of all music."

Bingley gives a singular anecdote of the effect of music on a pigeon, as related by John Lockman, in some reflections concerning operas, prefixed to his musical drama of Rosalinda. He was staying at a friend's house, whose daughter was a fine performer on the harpsichord, and observed a pigeon, which, whenever the young lady played the song of "Speri-si," in Handel's opera of Admetus (and this only), would descend from an adjacent dove-house to the room-window where she sat, and listen to it apparently with the most pleasing emotions; and when the song was finished, it always returned immediately to the dove-house.

A bird-catcher, wishing to increase his stock of bullfinches, took out his caged bird and his limed twigs, and placed them in such a situation of hedge and bush as he judged favourable to his success. It so happened that his own bird was one of education, such as is usually termed a *piping* bullfinch. In the first instance a few accidentally thrown out natural notes, or calls, had attracted three or four of his kindred feather, which had now taken their station not far distant from the cage. There they stood in doubt and curiosity, and presently moving inch by inch, and hop by hop towards him and the fatal twigs, they again became stationary and attentive. It was in this eager and suspended moment that the piping bullfinch set up the old country-dance of *Nancy Dawson*. Away flew every astounded bullfinch as fast as wings could move, in such alarm and confusion as bullfinches could feel and they only can venture to describe.

Captain Alexander, in his "Transatlantic Sketches," says:—"I have seen the Cobra di Capello, or hooded snake of India, caught in my garden; have watched the snake-charmer, with feathered turban, sitting beside a hole, under the hedge of prickly pear, and piping on a rude musical instrument made from a gourd, and a bit of looking-glass in front of it; unlike 'the deaf adder,' the head of the cobra would soon appear above the ground, as if listening to the wild strains, and his eye attracted by the dazzling glass. An assistant would be ready to catch him behind the neck, would draw forth his yellow and writhing length, and, without extracting the poisonous fangs, would slip him into a covered basket, muttering the usual curse of 'Hut teré!' Next day the snake-charmer would return, place his basket on the ground, sit on his

haunches before it, and pipe; the lid would rise, and the subdued snake come forth, partly coil himself up, and move his head to the music, and ever and anon display his spectacled hood, or hiss when the charmer approached his hand. The assistant would go behind and hold up the reptile by the tail, when he could do no injury; but if a fowl were thrown to him, he killed it in a moment."

In the human ear the fibres of the circular tympanum radiate from its centre to its circumference, and are of equal length; but Sir E. Home found that in the elephant, where the tympanum is oval, they are of different length, like the radii from the focus of an ellipse. He considers that the human ear is adapted for musical sounds by the equality of the radii, and is of opinion that the long fibres in the tympanum of the elephant enable it to hear very minute sounds, which it is known to do. A piano-forte having been sent on purpose to the menagerie in Exeter 'Change, the higher notes hardly attracted the elephant's notice, but the low notes roused his attention. The effect of the higher notes upon the lion in the same place was only to excite his attention, which was very great: he remained silent and motionless; but no sooner were the flat notes sounded, than he sprang up, attempted to break loose, lashed his tail, and seemed so furious and enraged as to frighten many of the spectators. This was attended with the deepest yells, which ceased with the music. Sir E. Home found this inequality of the fibres in neat cattle, the horse, deer, the hare, and the cat.—*Phil. Trans.*

* At Paris some curious experiments, almost of the same nature, were made, of the power of music on the

* Bingley.

sensibility of the elephant. A band of music was sent to play in a gallery extending round the upper part of the stall in which two elephants were kept. A perfect silence was procured. Some provisions of which they were fond were given them to engage their attention, and the musicians began to play. The music no sooner struck their ears, than they ceased from eating, and turned in surprise to observe whence the sounds proceeded. At the sight of the gallery, the orchestra, and the assembled spectators, they discovered considerable alarm, as though they imagined there was some design against their safety; but the music soon overpowered their fears, and all other emotions became completely absorbed in their attention to it. Music of a bold and wild expression excited in them turbulent agitation, expressive either of violent joy or of rising fury. A soft air, performed on the bassoon, evidently soothed them to gentle and tender emotions, while a gay and lively air moved them to demonstrations of highly sportive sensibility; and other variations in the music produced corresponding changes in their emotions.

SIGHT.

"THAT beautiful instrument the eye, so artistically contrived that the most ingenious workman could not imagine an improvement of it, becomes still more interesting and more wonderful, when we find that its conformation is varied with the different necessities of each animal. If the animal prowls by night, we see the opening of the pupil, and the power of concentration in the eye increased. If an amphibious animal has

occasionally to dive into the water, with the change of the medium through which the rays pass, there is an accommodation in the condition of the humours, and the eye partakes of that, both of the quadruped and the fish. Again, in fishes whose eye is washed by the element in which they move, all the exterior apparatus is unnecessary, and is dismissed; but in the crab, and especially in that species which lies in mud, the very peculiar and horny prominent eye would be quite obscured were it not for a peculiar provision. There is a little brush of hair above the eye, against which the eye is occasionally raised to wipe off what may adhere to it. The form of the eye, and the particular mode in which it is moved, and the coarseness of the instrument, compared with the parts in the same organ in the higher class of animals, make the mechanism of eyelids and of lachrymal glands unsuitable."*

The first traces of the perception of light are found in the lowest scale of animal life. The polypi and infusoria turn to the light, as has been already mentioned. The *monas sulphuraria* (*M. Dunalii*), *stentor niger*, the *actiniæ*, and fresh-water polypi seek the light, but change their position if exposed to the full glare of the sun, and sink beneath the surface before any part of their bodies comes in contact with the atmosphere. *Veretillum cynomorium* (a species of zoophyte) seeks the darkest spots, and folds itself together if brought within the influence of the light. In all these animals the power of sight, or rather the sense of perception, seems to be spread over the whole surface of the body, as is the case with many blind persons, who by some peculiar properties of the skin can distinguish between a dazzling and a gloomy light; and Colhoun has remarked, that

* Lord Brougham ; A Discourse of Natural Theology.

on the eyes being fully closed, the sensation of light is experienced by the skin of the face, particularly in the region of the forehead; and indeed, if we turn our faces to the light, and pass the hand up and down before the closed eyes, a remarkable difference is perceptible, and, as if by an adaptation to the circumstance, or that really a greater degree of sensibility is thrown over the body when the eyes are closed, people moving about or groping their way in the dark, commonly shut their eyes. The skin is not absolutely opaque; for the gleam of the sun penetrates through the closed eyelids, and even the sides and joints of the fingers.

The rudiments or first traces of sight are found thus among these infusoria, and in the medusæ which rise to the surface of the sea in calm weather; the coating of the body is in some parts transparent, and a colouring particle is imbibed by some nervous agency, as was discovered by Baër in the planaria torva. Among the infusoria with eyes, the vibrio shuns the light, and, as observed by Carus, thrusts itself on the shady side of the glass, while others, such as *Chlamidomonas pulvisculus*, and *Euglena viridis deses* and *triquetra*, have been proved by repeated experiments to seek the light. Perception is in these cases so blended with the sensibility pervading the whole body, that no distinct consciousness of the peculiar properties of light and colour can be possible. Sight is here at its lowest point; a mere perception or consciousness of light, similar in every respect to that which exists in snails, as has been proved experimentally by Mielzynsky. He held a pointed instrument in the direction of their feelers, but they paid no attention to it, whether bright or dark, till they ran against it, and yet they are capable of seeing. He shut a number of them into a

tin box, in the lid of which two tubes were inserted, the one covered with tin on the top, and the other with glass; and, having compelled the snails to climb upwards by pouring water into the box, they all crawled up the tube pervious to the light, but if he deprived them of their feelers, they took to either tube indiscriminately. Thus snails can distinguish light and dark, but not objects. The proteus and the mole, which live in darkness, have such imperfect organs of sight, that, instead of seeking the light, their great object is to avoid it, but yet they possess the power of distinguishing objects and of moving towards them. The proteus, for instance, will snap at a small fish passing within its reach, but will leave untouched matters which do not concern it for food. It is most probable that in this and similar instances the deficiency in the powers of one sense is compensated for by an additional organ in others. Leeches, notwithstanding their imperfect vision, perceive people bathing; and a species inhabiting the land in the island of Ceylon comes forth in wet seasons and attacks any one who may remain stationary for only a few minutes. Several varieties of fish, whose eyes are fixed on the upper surface of their bodies, cannot see what prey they swallow; and others (myxine glutinosa, amphioxus lanceolatus,) have no outward indication of an eye; some insects, as the *claviger*, found in ant-hills, the *anophthalmus stomoides*, and multitudes of other classes (infusoria ascidiæ, most shell-fish, parasitical crustacea, and some mites,) distinguish readily between their appropriate food and baneful substances.

The form of the eye is globular: it varies considerably in its disposition, being chiefly more or less protected by the adjoining parts, and, often as in some of the crustacea, attached to a stalk or pedicle. The eyes

of the chameleon are extremely prominent, and are capable of moving in different and separate directions at the same time, so that the animal can command a large range on either side; a remarkable provision, which, compensating for its natural inertness and slowness of motion, enables it to seize any insect coming within its reach. Many insects have a plurality of eyes, disposed in such various directions that they are warned of danger from all sides. Burmeister says, that insects become inactive in the dark, but resume their movements in the light. Moths are attracted by light in the most singular manner.

In the higher classes of aquatic beings the crystalline lens is more convex than in the terrestrial; and in the amphibia, such as the beaver, otter, and seal, it reaches a medium between the two. Predatory fish, frequenting the depths of the ocean, have larger eyes than those which are found in shallower parts.

Most birds, particularly those of prey, are furnished with a nictating membrane, which closes over the eye like a veil, subduing equally the dazzling rays of the sun, and its powerful reflections from other objects. Their eyes take in a great portion of the foremost part of the head, and by their size, their position, and their strongly arched horny tunicle, they are able, as is peculiarly the case with the predatory classes, to embrace an immense range of vision, and even to distinguish their prey from a considerable height. The majestic eagle sweeps along with daring flight, braves the rays of the unclouded sun, and soars in the highest regions of the atmosphere; from thence his piercing eye commands a vast expanse, and descries from afar, in the profundity of the valley, perched upon the tree, or hovering in the air, the victim he has marked for his

prey—he darts upon it like the lightning, seizes it with irresistible talons, and exulting in his victory, transports it to the retired rock, or deserted plain, tears it in pieces and devours it. It is not possible to look upon him without discerning in his external form the supreme force, the energetic springs, the fiery rage of formidable majesty. Has not his sparkling eye all the fire of a flash of lightning? Who but he dares to fix a steady look on the dazzling orb of day? Examine every eye downward to that of the mole—where is to be found that penetrating, firm, and rapid glance which seizes the whole horizon at once? Where find such a relation between eyes and the light? The aquatic birds have a small eye, and in the divers it is even still more reduced, and protected by a moveable film. These distinctions are remarkable and most appropriately contrived, for, unlike the land bird, which either has to discover its food from afar, or to distinguish it among other substances covering the earth's surface, it readily perceives objects moving and floating in the water, and requires only a means of shielding the organ from the action of the water. The eyes of birds which fly abroad and seek their prey by night are so incapable of confronting the light, that they have only the full power of sight at twilight, and the pupil is then so distended that it admits an unusual proportion of the rays of light; a construction precisely similar to that which is found among animals of the feline species. In these as well as among the other carnivores, the pupil appears like a perpendicular line, by which means the sight is more concentrated, and is remarkably keen in moments of excitement and when the animal collects itself for the fatal spring upon its prey. The herbivores, on the contrary, have an extremely broad

pupil, by which a considerable degree of lateral light is admitted, and the approach of danger from the side is more readily perceived. The giraffe, as noticed by Salt, has the frontal bone so extremely prominent that its range of sight is necessarily limited to what is beneath it, and, indeed from its lofty stature any direction of sight upwards would be altogether useless.

The perfection of the power of perception is conditional on its keenness and delicacy, which depend entirely on the perfection of the organs of sense; and as regards that keenness, with the exception of that connected with taste, many animals excel the human race, although in the extent and quality of their perceptions, that is, in the clear, defined, and intelligible apprehension of them, they cannot be placed in comparison. This is more especially the case with the senses of hearing and of sight, although even in some animals the former is not confined to a mere perception of sound, but is capable of distinguishing harmony. It is at its lowest point in the guana lizard, and hooded snakes (*cobra di capello*), but some mammalia, such as dogs, can perceive the difference between wind and string instruments. A greater development is already established in birds, which excel even the mammalia, although they can understand the intonations as well as the words of the human voice, which faculty Scheitlein ascribes to the greater power of the intellect. Sight assumes a higher rank in the scale as soon as it is susceptible of colour. It is supposed that serpents distinguish their keepers by the colour of their clothing. Oxen and turkeys have a violent antipathy against anything red, or it excites them to fury. It is highly probable that all the higher orders of animals distinguish between, and have preference for, certain colours,

and it is certain that in their younger age they are attracted by bright ones.

The essential distinction between the human and the animal races consists in the property which the former has of feeling the influences of refinement, goodness, beauty, truth, morality, and eternity, of none of which the latter are susceptible.

> The consciousness of things eternal is confin'd
> To those alone who to its hopes are heirs.—TIEDGE.

Reason is the exciting principle; by its agency we perceive our spiritual existence, which is no reflection of a distant object, but a heavenly light—no echo, but the voice of consciousness.

Reason, therefore, as that principle of distinguishing moral influence (conception of ideas) creates the actual and pronounced distinction between man and animal kind; for even the most perfect animal, and the wildest savage, the child and the creeping thing are two totally distinct beings, and between the two classes in this respect an immeasurable gulf extends, whose shores are eternally separated.

RECOLLECTION.

By the force of perception, the animal arrives at an immediate consciousness of natural objects, but the impressions thus received, being successively acted upon by others following in rapid course, are weakened as they recede, without, however, being totally effaced. They are no shadowy forms, nor empty sounds, the sport of every wind, but the actual expressions of the mind, called forth with noon-day brilliancy from the

dark receptacles of the past, like flowers, whose closed petals re-open themselves on the return of the reviving sun. The animal has a knowledge of former circumstances in its recollections of the past.

According as these revived impressions are true in their resemblance to the originals, or are more or less at variance with the substance, are we justified in styling them either as creatures of the recollection, or of the imagination.

MEMORY.

The chief function of memory consists in the certain knowledge of any individual object or circumstance, being identical at the present time with that of a former period, and we then call it recognition. Bees revisit their old haunts, the trees and the flowers where they have been used to find honey; they recognise their own hive among many others; returning to it in their homeward flight in a direct line, and never hesitating between it and the surrounding ones. It is highly remarkable that they know their hive more from its locality than from its appearance, for if it be removed during their absence and a similar one be substituted, they enter the strange one. If the position of a hive be changed, the bees for the first day take no distant flight till they have thoroughly scrutinised every object in its neighbourhood; and it is asserted by Kirby and Spence, that the queen bee does the same thing, making several probationary flights before the swarming of the hive, as if to select the proper spot. They also mention the circumstance of a number of bees

having been attracted in the autumn to some honey which had been placed in a window, and of their visiting the same spot in the ensuing spring in search of it again. The mason-bee contrives holes as receptacles for its young, in which it lays up their food; and if a hole be closed up during its absence, it searches for some time along the wall after its return, without noticing other holes, and having found it, it removes the obstruction and continues its work; a clear proof that these bees can distinguish between their own holes and those of others.

Stickney relates a remarkable instance of memory in some bees, which having taken possession of a hollow place beneath a roof, and being removed into a hive, continued for several years to return and occupy the same hole with their swarms. Bees certainly recognise those persons who feed them and attend to them, and the same thing has been noticed in spiders. Some ants which had been turned out of a sugar-case, through whose key-hole they had found an entrance, returned again in the same manner. Swallows and storks on their return in the spring, re-occupy their old nests, and birds which have been fed during severe weather will present themselves for the same purpose in the ensuing year. Pigeons, cats, dogs, and horses, return to their former homes from the greatest distances. Goats, sheep, and swine find their way to their respective enclosures, and horses select their individual stalls from a hundred others; they recognise their former comrades, their grooms, their riders, and the inns they had been fed at, after an interval of years; they distinguish between those who have attended or misused them, and remembering the pain of an operation, they strike out at the farrier who performed it;

and thus also the poodle dog conceals itself from the person who clips it.

The dog remembers his master and the members of his family after an absence of years, and the persons of those who have ill-treated it. One which M. d'Obsonville took with him from Pondicherry on a journey of upwards of three hundred miles, through a country hardly intersected by a road, and which occupied three weeks to traverse, having lost its master, returned at once to Pondicherry. Similar instances of the power of memory, and of finding their way through strange districts, are of daily occurrence, and it is astonishing with what speed they return to their homes from remote distances. The dog of an officer who fell in battle in Poland, found its way back to his estate near Leipzig in an inconceivably short space of time. The dog of a little Savoyard being sold and carried to Rome, was shut up for safety, but it soon succeeded in making its escape, and reached its former home after a few days in a most emaciated state. The hunted fox, driven by the chase far beyond its accustomed haunts, finds its way back to them in the course of a few hours.

These cases may be multiplied to any extent; and the numerous facts that are recorded are familiar to almost every reader. No animal is so entirely ungifted as not to have a consciousness of the circumstances and place in which it has previously found food or shelter, or has been attended to; and in the entire range of the operation of the various faculties, from the lowest glimmering to their most perfect development, nature has so excellently adapted them to each want and mode of life, and has so beautifully counterbalanced them, that in the whole scheme of the creation no greater harmony can be found.

This power of memory is the source of obedience, discipline, habit, and intelligence in the animal, and enables man to direct the energies he has controlled. The lesson once taught, the training and submission once enforced, are never forgotten, and even produce new and astonishing proofs and combinations of intelligence.

Mr. Brockedon, in his "Journal of Excursions in the Alps," says: "In these valleys, the early hour of retirement placed us in the difficult situation of fighting our way to the inn-door at Lanslebourg against a magnificent Savoyard dog, who barked and howled defiance at our attempts, for which he stood some chance of being shot. At length, however, a man hearing our threats, popped his head out of a window, and entreated our forbearance. We were soon admitted, and refreshments amply provided. I had heard a story of a duel fought here, from Mr. N., in which he was a principal, about a dog, and, upon inquiry, learnt that this was the same animal. A party of four young officers returning from Genoa, stopped here. Mr. N. had brought with him a beautiful little pet dog, which had been presented to him by a lady on his leaving Genoa. Struck by the appearance of the fine dog at the inn, one of the officers bought it. He was fairly informed that the dog had been already sold to an Englishman, who had taken it as far as Lyons, where the dog escaped, and returned (two hundred miles) to Lanslebourg. The officer who made the purchase, intended to fasten it in the same place with the little dog; this Mr. N. objected to, when his brother officer made some offensive allusions to the lady from whom the pet had been received. An apology was demanded, and refused. Swords were instantly drawn; they fought in the room. Mr. N. wounded and

disarmed his antagonist; an apology for the injurious reflections followed, and the party proceeded on their way to England, punished by having the painful duty to perform all the way of nursing their wounded companion. The dog, however, was taken and carried safely as far as Paris, where he again escaped, and returned home (five hundred miles!) I was now informed that the dog had been sold a third time to an Englishman, and again, in spite of precautions having been taken, he had returned to Lanslebourg from the sea-coast, Calais."

Lindley Murray states in his Memoirs, that, on visiting as a boy the elephants which were then kept at the Queen's stables, Buckingham House, he withdrew from one of them, with his cane, a part of the hay which it was collecting on the floor with its proboscis. The animal was displeased, and the keeper told him it would never forget the injury. Returning in about six weeks afterwards with some friends, he found that though some hundreds of people had been there since his first visit, the animal soon recognised him. He made no attempt to teaze it, and had no conception of any concealed resentment. On a sudden, however, when he was within the supposed reach of its proboscis, it threw it towards him with such violence, that had he not by an active effort thrown himself aside, he would probably have been killed, or have received some material injury.

* Mr. Hartley, in the Isle of Egina, narrates that, passing by a flock of sheep, he asked the shepherd if he gave names to his sheep, and if they obeyed him when he called them by their names. He bade him call one, he did so, and it instantly left its pasturage and its companions, and ran up to him with signs of pleasure,

* Miss. Regist.

and with a prompt obedience which he had never before witnessed in any other animal. Mr. Wilderspin says he frequently witnessed in Cumberland and other mountainous districts an illustration of the parable that the sheep know the good shepherd's voice. When the sun is about to set, the shepherd's boy advances along the foot of a chain of mountains, and, giving a signal by a peculiar call or whistle, the flocks, which were scattered like spots of snow over those stupendous heights, begin to move simultaneously, and collecting, as they pour down the steep descent, approach him in order, without leaving one solitary straggler.

How wonderful is that instinct by which the bird of passage performs its annual migration! But still more wonderful is it when the bird, after its voyage of thousands of miles has been performed, and new lands visited, returns to the precise window or eaves where the summer before it first enjoyed existence. And yet such is unquestionably the fact. Four brothers had watched with indignation the felonious attempt of a sparrow to possess itself of the nest of a house-martin, in which lay its young brood of unfledged young ones. They attempted to take summary vengeance with blowguns, but their well-meant endeavours brought destruction on the hapless nest, and the young birds came to the ground. Being placed in the open window of an unoccupied room, the parent birds, after their first terror was over, did not appear disconcerted by the change of situation, but hourly fed them as usual, and testified by their unwearied twitter of pleasure, the satisfaction and confidence they felt. There the young birds were duly fledged, and from that window began their flight, and entered upon life for themselves. The next spring, with the re-appearance of the martins, came four,

which familiarly flew into the chamber, visited all the walls, and expressed their recognition by the most clamorous twitterings of joy. They were without question the very birds that had been bred there the preceding year.

IMAGINATION.

Is the ideal representation of circumstances or objects, making them to pass before the mind as if reflected in a mirror with all the force of reality, and enabling it to form immediate conclusions, and to act upon them. This power is shared by animals, and, if analysed, will be found to be the instigator and exciting cause of many of their actions and impulses. Thus, the yearning for former homes, and the longing for the chase, are feelings or desires, raised by the recollection of pleasures enjoyed, acting on the mind or seat of intelligence. It also shows itself in many of the minor occurrences of life. A dog, which refused dry bread, and was in the habit of receiving from his master little morsels dipped in the gravy of the meat remaining in the plate, snapped eagerly after dry bread if he saw it rubbed round the plate, and as, by way of experiment, this was repeatedly done till its hunger was satisfied, it was evident that the imagination of the animal conquered for the time its faculties of smell and taste. It is even thus with the enjoyments which man acquires to himself, where the imagination seasons and exalts them, and even in many instances actually produces them. It shows itself, however, in the most marked and spontaneous form in dreams, in playfulness, and in the home sickness.

DREAMS.

The organs of sense and motion are at rest when sleep asserts its power over the frame; the doors of communication with the outward world are closed, and the soul, cut off from all communion with material things, is, as it were, isolated, and in a state of passive existence. The powers of the soul remain, without the necessary consciousness of outward things; and it is only incited by them, through the medium of its own activity, when the senses themselves are sunk in the deepest sleep.

It is impossible to say at what stage of organised matter, dreams, as the creations of the thus isolated soul, begin. Comparisons are abundant; the lower animals are dreamers, and their lives somnambulism. If we consider this proposition as a metaphor, it is still a comparison. Life in the lower order of animals is different in character to that of the upper. The limited development of the nervous system, and of the organs of sense, proclaims a more confined and benighted range of perception, a feeble sensibility, and dimly-shadowed wants. The consciousness of outward things is faint, the feeling of self-identity obscure, and the power of observation is restricted to the recognition of its own species. The principle of life is monotonous, without rhythm of action, and sleeping and waking are almost identical. Dreaming is, therefore, the consequence of the inward principle without the agency of the dormant senses and the organs of motion.

Crocodiles dream; and in birds and the mammiferous animals the phenomenon is remarkably perceptible.

When the impressions of the dream assume a particularly vigorous and distinct character, they affect the slumbering voice and limbs, and thus prove most satisfactorily and clearly that animals really do dream, besides affording the strongest grounds for the assertion that animals possess an inward sense, analogous to the faculty of the soul.

Among birds, the stork, the canary, the eagle, and the parrot; and among the mammalia, the elephant, the horse, and the dog are excited in their dreams. The hound betrays his dream by a hoarse, suppressed bark, and by a convulsive movement of the limbs. Dogs are prone to dream; and then they may be observed to move their feet, they make efforts to bark, agitate themselves as if they were hunting, or become excited till the hair rises on their flanks, and the skin becomes clammy; yet when awake, they scarcely ever sweat, but cool themselves by panting and hanging out their tongue.

Bennet noticed that water-birds moved their legs in their sleep, as if in the act of swimming; and Hennah heard the hyrax utter a faint cry.

PLAYFULNESS.

In the waking hours the influence of the imagination manifests itself by a playfulness of manner, and an exuberance of the animal spirits. The animal in its sportive moments abandons itself to a feeling in which its whole being seems to be concentrated in the performance of some one of its passions, whether of joy or mischief, defiance or fear. Erdl, who has bestowed

great attention to the habits of the crustacea, says that he has seen the Cancer Moenas play with little round stones, and empty shells, as cats do with a cork, or small ball. Dogs, particularly young ones, are carried away with the impulse, rolling over, and chasing each other in circles, seizing and shaking objects as if in anger, and enticing even their masters to join in their games. Horses, in freedom, gallop hither and thither, snort and paw the air, advance to their groom, stop suddenly short, and again dash off at speed. A horse belonging to one of the large brewing establishments in London, at which a great number of pigs were kept, used frequently to scatter the grains on the ground with his mouth, and as soon as a pig came within his reach, he would seize it without injury and plunge it into the water-trough. The hare will gambol round in circles, tumble over, and fly here and there. Brehn witnessed one which played the most singular antics with twelve others, coursing round them, feigning death, and again springing up, seemed to illustrate the old saying of "mad as a March hare." The same thing occurs with rabbits, and many others of the rodentia; and on warm days fish may be seen gambolling about in shoal water. Carp, in early morning, while the mist still hangs on the water, wallow in the shallows, exposing their broad backs above the surface. Whales, as described by Scoresby, are extremely frolicsome, and in their play leap twenty feet out of the water.

Small birds chase each other about in play, but perhaps the conduct of the crane and the trumpeter (*Psophia crepitans*) is the most extraordinary. The latter stands on one leg, hops about in the most eccentric manner, and throws somersets. The Americans call it the mad bird, on account of these singularities.

The crane expands its wings, runs round in circles, leaps, and throwing little stones and pieces of wood in the air, endeavours to catch them again, or pretends to avoid them as if afraid. Water-birds, such as ducks and geese, dive after each other, and cleave the surface of the water with outstretched neck and flapping wings, throwing an abundant spray around.

Deer often engage in a sham battle, or a trial of strength, by twisting their horns together, and pushing for the mastery. All animals that pretend violence in their play, stop short of exercising it; the dog takes the greatest precaution not to injure by his bite, and the ourang outang, in wrestling with his keeper, attempts to throw him, and makes feints of biting him. Some animals carry out in their play the semblance of catching their prey; young cats, for instance, leap after every small and moving object, even to the leaves, strewed by the autumn wind; they crouch, and steal forward ready for the spring, the body quivering and the tail vibrating with emotion, they bound on the moving leaf, and again watch, and again spring forward at another. Rengger saw young jaguars and cuguars playing with round substances like kittens.

Young lambs collect together on the little hillocks and eminences in their pastures, racing and sporting with each other in the most interesting manner.

Birds, of the Pie kind, are the analogues of monkeys, full of mischief, play, and mimicry. There is a story told of a tame magpie, which was seen busily employed in a garden, gathering pebbles, and with much solemnity, and a studied air, dropping them in a hole, about eighteen inches deep, made to receive a post. After dropping each stone, it cried, Currack! triumphantly, and set off for another. On examining the spot a poor

toad was found in the hole, which the magpie was stoning for his amusement.

* Two Beavers which were kept for some time in the menagerie at Exeter Change, were very tame, and exceedingly gay and frolicsome, wrestling and playing with each other, as far as the limits of their small apartment would admit, and if anything was given them to play with, they would drag it about, and seem highly pleased with it.

HOME-SICKNESS.

The recollections of former happy circumstances, compared with those in which we are actually placed, produce a contrast, which in proportion as those former impressions fix themselves with increasing force and vividness in our minds, create a morbid and overwhelming feeling, which is home-sickness. It is a fanciful longing for early known and dearly loved localities, although still not entirely confined to them; for as it exists by association of things and objects connected with them, it embraces in its range the companionship which endeared those spots. This feeling is most undoubtedly shared by animals in its fullest intensity, both as regards locality and companionship of its own species, as well as in the love for their masters, or old protectors. Perhaps it is strongest and most observable in the higher orders of animals, but there is hardly a class which cannot be pointed to as not possessing it in some degree. Pigeons, dogs, cats, and horses, when removed from their former homes, give repeated and daily instances of the fact. It crushes

* Bingley.

and overwhelms the faculties of the mind, and prostrates the energies of the body. Thus many birds, when encaged, become so entirely spirit-broken, that they refuse all nourishment, pine for a few days, and die. This is particularly the case with song-birds; and the Nightingale, if caught late in the spring, and when it has already paired, is hardly ever known to survive. The Roller rejects its food and seldom survives three days, and the full-grown Bustard sinks from obstinacy and grief. The rapacious birds, though of bolder tempers, become equally sullen and indifferent to food, and, but for their extraordinary powers of endurance, would also soon perish. If the Howling Monkey is caught when full-grown, it becomes melancholy, refuses all food, and dies in a few weeks; it it also the same with the Puma; and Burdach states that death sometimes ensues so immediately, that it can only arise from a sudden and violent pressure on the mind.

At the periods of migration, imprisoned birds become extremely restless, although they are supplied with abundance of food, and are secluded from any influence of the temperature; but they resign themselves and become contented when the time has passed. In multitudes of instances where identity has been clearly established, it has been proved that these wanderers return every year to the same neighbourhood, nay, even to the same spot in it, which they had before haunted. We have almost daily instances brought before us of dogs and cats being taken away in carriages at night, to a very considerable distance from their homes, to which they nevertheless find the means of returning.* There is the well-known story of the Ass, which swam ashore from a vessel shipwrecked at the Point de Gal, and finding

* Kirby and Spence.

its way back to Gibraltar, a distance of more than two hundred and fifty miles, in a few days, sought out immediately its former stall, from which it had been embarked. The desire of remaining constant to one neighbourhood is spread through the whole animal kingdom, and there are but few species which pass a life of continuous movement and change. They change their quarters with reluctance, and never undertake a distant journey but in company with many others of their own species, which seems to reconcile them to the necessity. But these migrations are only periodical, and they return to their former homes in immense numbers, as soon as their instinct teaches them that the necessity which drove them forth, no longer exists. It is thus with the reindeer, in Lapland, which, tormented by flies, pass off in herds from the interior down to the coast.

This attachment to a peculiar locality is remarkably conspicuous in fish, which, at the spawning season, return to the same spots, where they themselves were produced. Salmon have been caught and marked, and for many recurring years have been found again in the same waters; facing obstacles almost insurmountable, in order to achieve their purpose. The wearied horse pricks its ears, and seems to gain new energies as it advances towards its home; and if ill or injured, it recovers much sooner in its own stall, and with its accustomed companions, than in a strange place, where it becomes restless and cheerless. Draught-horses, which, besides standing in neighbouring stalls, have been in the habit of working together, possess the greatest attachment for each other, and if one be fixed in its traces by its driver, the other spontaneously places itself by its side, and they willing share their work; but if separated, they lose their appetite, work less freely, and

make efforts to get together. Such and similar affections characterise domesticated animals, which can only be reconciled to change by kindness and gentle usage.

Lord Monboddo relates the following singular anecdote of a serpent:—"I am well informed of a tame serpent in the East Indies, which belonged to the late Dr. Vigot, once kept by him in the suburbs of Madras. This serpent was taken by the French, when they invested Madras, in the late war, and was carried to Pondicherry in a close carriage. But from thence, he found his way back again to his old quarters, though Madras was above one hundred miles distant from Pondicherry."

These various points sufficiently illustrate the fact, that animals possess equally with man an inward faculty or power, which acts on the imagination, and shows itself in dreams, in play, and in the absorbing cravings after home. Man enjoys a creative fancy as well as an imagination; he is excited by what is beautiful, and brings within the scope of his understanding, the laws which regulate the material world with which he is surrounded, and hence proceed the inventive genius of poetry and the acquirements of science.

THOUGHT.

It is impossible to venture an opinion as to whether animals possess the actual power of thought, that is, the comprehension, and identity of impressions necessary to establish an idea, and to arrive at a clear result. Herbart, in his work on Psychology, says:—"The

savage and the animal possess, without doubt, the perfect faculty of distinguishing objects of a similar character, and of discriminating between those of opposite natures, such as trees, houses, men, &c., but they are not equal to combine matters, or to separate them when in combination. A general conception has not the capacity to enter into an analysis, which belongs only to the higher faculties. Hence we perceive the contrast between space and what is spacious, and between time and what is temporal, and can conceive the difference between our own personal identity, and our ever-changing condition, while the animal, fighting and quarrelling for its bone, is only conscious of an existence independent of its antagonist."

But if animals are not capable of any abstract notions, nor sensible of the causes of things, and cannot, consequently, possess the power of thought, nor seek for reasons for reason's sake, there are yet many points in their idiosyncracy so entirely analogous to that of man, that they must be referred to that standard to become intelligible. We see that they are endowed with the power of discrimination and attention, that they regulate their actions by experience, look for the recurrence of things, distinguish between time and space, can calculate the passage of time, and commit blunders; all of which prove the presence of a mental power.

The application of the senses depends, corporeally, on the same organ both in man and beast, namely, on the vitality of the brain, and is entirely guided by its efficacy, particularly in the perfect organisation of its hemispheres. The study of the manners and habits of animals, and the different experiments which have been made, clearly demonstrate this fact; for if the brain be injured by pressure, concussion, the intrusion of any foreign

substance, or if it be disturbed in its functions by illness, torpor, unconsciousness, imbecility and madness will ensue, while the same causes may not in the least degree affect the principles of life.

DISCRIMINATION.

This faculty is an evidence in itself of the power of thought; for, resting on the comparison between two or more objects, it shows opinion and judgment. Every animal is conscious of its own identity, that is, of its possessing a being distinct from others of its own species, and from all other objects; but some are susceptible of more refined distinctions. Fothergill knew a tortoise which readily recognised the members of the family to which it belonged, and allowed itself to be handled by them, but it withdrew from the presence of strangers. Still, in many instances, this faculty has its limit, and cannot arrive at individual distinctions, but recognises only the difference of species, which, as regards the means of existence and of preservation, is a most bountiful and provident arrangement, since it enables the animal to perceive its enemies, its friends, and even its prey, without attempting a narrow investigation. Its sense in this respect is perfect, and is not led astray by varieties either of colour or of form. Thus, a parrot, having learned to call the white poodle of the house, "Mouton," eventually applied the same term to dogs of totally different appearance and colour. Animals distinguish readily between different parts, and direct their sight to the eye of the object before them, as being

the organ which, by its expression, communicates to them the inward feeling or temper of the party. The power of the human eye on savage animals is wonderful in this respect, and, by a glance at it, the dog knows thoroughly the humour of its master. Herons and bitterns, when wounded, attempt to fly at the eyes, and therefore, in the days of hawking, the falconer's first point was to plunge the beak of the bird into the earth, to secure it from doing mischief. Domesticated animals distinguish between strangers and the members of the household, and dogs growl at and even seize beggars and intruders, without having been taught to do so. Inglis asserts most truly that swallows show no alarm at the people of the house on which they have built their nests, even if they watch them, but that they are uneasy at the presence of strangers. Game birds distinguish between the persons of those from whom they have nothing to fear, and the sportsman; and it is a common remark that crows will allow the near approach of an unarmed person, while they will not permit him with a gun to come within shooting distance. On a foot excursion the author was making in Germany, he slept one night at Würzburg, where a great fair was being held, and the streets being extremely crowded as he passed through them in the morning to resume his journey, his companion, the splendid white poodle just now mentioned, lost him. He did not miss him for the first two miles, and on returning to look for him, and having great faith in his sagacity, he went straight to the inn, where, to his surprise, he was received with a shout of welcome. It seems that the animal, immediately after missing him, ran back to the inn, and distinguishing the room he had occupied from many others in a long gallery, leaped on the bed, and would allow no

one even to enter the room. At the same period, it was in November, and the frosts had set in with some severity, but had yielded a little to the power of the sun in spots on the hill-sides having a southern aspect, and on these, numbers of crows and magpies had assembled, and were busy foraging for food, which, by their spiritless appearance, they were evidently suffering for. It was a slight circumstance to remark, but it was a strong proof of discernment in the birds.

ATTENTION

Is the endeavour to account for, or to bring clearly to the comprehension, some circumstance which is about to occur, and which by the medium of one of the senses has in a manner announced itself. Thus the horse pricks its ears and listens when it hears a sound in the distance, and other animals start perceptibly. Dogs and cats watch for the opening of a door to effect their escape. Cuvier relates the anecdote of a monkey, which on being tied, took peculiar notice of the manner in which the knots were fastened, and released itself as soon as it was left alone.

Attention betokens a certain development of the mind, and a lively communion of its powers with the outward world, by which not only individual objects, but also various and rapidly succeeding changes are perceived. Its range and acuteness depend on the keenness of the organs of sense and on the activity of the mind, and by a reversed principle the senses are equally brought into a greater degree of refinement and vigilance, by a constantly excited attention, which is

particularly the case when any one of the senses is diseased or altogether lost. Thus blind horses have a quicker perception of sound and a sharper ear, and on that account the German carriers, who traverse wide extents of country with huge waggons of merchandise, do not object to have them in their team, as their obedience to the voice and the crack of the whip allows the drivers to walk apart from them on the foot-road. The exhibitors of horsemanship say that they find a horse blind of one eye to be more attentive and easy of instruction than the perfect animal.

Blindness in the human race strengthens materially the powers of the remaining senses, and we see universally that where the influence of the mind is directed to the observations of outward and visible things, and that where also it seeks to penetrate into its own depths, and to occupy itself with its own impressions, its perception and power of attention are peculiarly susceptible. It is hence that the wild races so far exceed the civilised ones in keenness. The Tartar and Arab tribes can distinguish the dust of a caravan at a distance which Europeans can hardly discern with their glasses, and can even distinguish the track of game by the cropped grass. The Canadians follow the traces of a man or an animal for days together, as well upon the rough ground as upon the soft turf, and decide by the form and size of the footstep upon the tribe or people to which it belongs. The Missouri Indians steer their course with ease through strange districts, not deviating from it in the darkest night, as if propelled by instinct. According to Le Vaillant, Hottentots smell water at a great distance, and can even distinguish a sunk spring by the exhalation of the vapour. The North American fur-dealers trust themselves entirely to the intelligence

of their dogs, and lay themselves unconcerned in their sledges, in the most violent snow-storms, when no trace of a road remains, knowing that the animals after having run round in various directions to satisfy themselves of their point, will steer straight to the nearest habitation. The Siberian dogs, when the darkest nights are rendered more difficult by the driving snow-storm, find their way to the huts buried deep beneath the drifted snow, and indicate their position to their masters by gestures.

The spirit of attention in animals can be very considerably excited by rewards and punishment, which are the principal means employed in breaking them in for service; but to keep the attention alive, everything is removed which can distract it. In breaking-in horses, the riding-master has for this reason only one brought forward at a time; and gamekeepers in training dogs always take them to secluded places, where they have them more under command.

EXPERIENCE, CHANGE OF PRINCIPLE OF ACTION, EXPECTATION OF RECURRING EVENTS.

The expectation of the recurrence of an event is the impression of a former circumstance, which, from certain causes and a resemblance of certain points, we are again led to entertain and to see fulfilled; the former is caused by the memory, and the latter by the understanding; for the imagination by a comparison of the past with the present, prepares the mind to receive a certain conclusive result.

This application of experience is traceable in the

lowest orders of life.* The razor shell-fish buries itself deep in the sand when left by the ebbing tide, and is attracted to the surface by a little salt being dropped into its hole. A movement in the sand immediately follows, and presently half the fish becoming visible, the fisherman draws it out with an iron prong; but should he fail in seizing it or relax his hold, the fish rapidly disappears, and will not rise again, although more salt be thrown to it. It seems thus to be aware of its danger, for it will come forth on the fresh application of salt, should it not have been touched in the first instance. Borlase says that he saw the attack of a lobster on an oyster. Lobsters, like most other crustacea, feed principally on shell-fish, which they extract with their claws, and in the instance in question the oyster closed its shell as often as the lobster attempted to insert itself; after many failures, the lobster took a small stone, which it placed between the shells as soon as they were separated, and then devoured the fish. Monkeys in the West Indies have been seen to resort to the same device. Crickets, if disturbed, withdraw quickly into their holes, and re-appear again soon; but if the disturbance be repeated, they remain altogether within them. A fox escaped from a trap in which it may have been caught, remembers the danger, and is not again to be deceived. Birds are equally suspicious. The quail which has once been enticed into the net by the call-pipe, will not allow itself to be caught again; but some, like the redbreasts and titmice, are not so readily alarmed. A wasp encumbered by the struggles of a large fly, which it had caught, bit its wings off, and then bore it away with ease: the same with a sand wasp, which attempted to draw a small moth into its

* Bingley.

hole, but being prevented by the wings of the insect, it separated them and the legs from the body, and thus secured it.

Dugés saw a spider which had seized a bee by the back and effectually prevented it from taking flight; but the legs being at liberty, it dragged the spider along, which presently suspended it by a thread from its web, leaving it to dangle in the air till it was dead, when it was drawn up and devoured.

The use of experience becomes more marked and extensive with age, the higher we ascend in the scale of life. Thus old birds are not so easily approached within gun-shot as young ones; old foxes are less easily caught in traps, and old stags show more cunning. On newly-discovered islands, the birds and animals have no fear of man, and the seals and other amphibiæ do not move at his approach; but a very short experience teaches them in what their safety consists. In tracts where the art of trapping has never been practised, the animals are at first caught in numbers, but by degrees they become more wary, and the hunter is compelled to use greater stratagems. In woods which are much hunted, the game is more shy and vigilant, while it seems fully to comprehend the sanctity of a preserve.

The judgment and the faculties of perception acquire an increased power by the effect produced by gone events. They vary not only according to the class of animal, but also in the individual, and in the mode of operation; for we see daily that animals of the same species, besides possessing different temperaments, possess also different degrees of intelligence. The understanding developes itself slower and in a less degree in simple relations, but is prompt and decided in the more intricate positions in which the animal may be placed. That

it is not an implanted or instinctive faculty is evident from familiar circumstances. The dog tied to its kennel, or confined in a stable, is dull and stupid; but the shepherd's dog in every district of the world is remarkable for its intelligence and activity: it keeps the flock together, prevents it from straying on the cultivated land, which it has learnt to distinguish, and protects it from predacious animals. Dogs of the chase improve in intelligence the more they are hunted, but in some respects this very point is objectionable to the sportsman, who corrects it by punishment. Thus the greyhound will often hunt cunning, as it is termed, that is, instead of following every angle and turn made by the hare, it anticipates those movements, and intercepts it by cutting across its path. Either the animal has little experience, or soon loses it in cases where the recollection is faint or the understanding weak. However frequently poultry may be driven from the sown land, they will always return to it, and yet fly from the spot at the re-appearance of the person who has previously chased them away. In such cases, the instinct after food is the governing impulse. Passion extinguishes the understanding and power of judgment, and hurries the animal to desperate and even fatal consequences. The Siberian bear caught in a noose, becomes enraged at the block of wood to which it is attached, and dragging it to the precipice, hurls it over, and is hurried over with it in its fall.

The experience that is once gained becomes finally a knowledge of connecting circumstances. In its early traces this knowledge arising from the recollection of successive occurring things, supersedes the power of perception; for it appears that animals place in a reasonable connexion things which take place at stated

periods and in regular succession. Pigeons, poultry, and even carp will flock to an accustomed spot at the sound of a bell, because food has always been thrown to them at such a signal. The pigeons at Venice are a remarkable instance of this, and, indeed go a step further, for they anticipate. The square of St. Marc's is the resort of a large number of these birds, which occupy every hole and corner of the ornamental architecture of the cathedral and the Doge's palace, owning no master, and picking up their living on the square and the adjoining quay, the only open spots in the city. Some individual living in the square has been in the habit, for a length of time, of scattering grain at a particular spot at two o'clock, previous to which hour the birds assemble in one place on the cathedral; and as the clock strikes, they all take wing and hover round his window in small circles, till he appears and distributes a few handsful of food. The pointer is wild with joy when it sees the sportsman reach his gun, and the little house-dog frolics round his master as he takes his hat. The dog which has been punished once for a fault, will either slink away or hide itself if it finds itself detected in the repetition of it. Sometimes, from force of habit, an animal will take that for granted of which the form only has been apparently gone through; thus, if we pretend to fasten a horse to an accustomed post, he will remain quietly by its side; or if we go through the action of throwing a stick into the water, a dog will plunge in as if to fetch it.

Animals are prompt at using their experience in reference to things from which they have suffered pain or annoyance. Grant mentions an ourang-outang which, having had, when ill, some medicine administered to it in an egg, could never be induced to touch

one afterwards, notwithstanding its previous fondness for them. A tame fox has been cured from stealing eggs and poultry, by giving them to him scalding hot from the saucepan. Le Vallaint's monkey was extremely fond of brandy, but would never be prevailed on to touch it again after a lighted match had been applied to some it was drinking. Two carriage-horses which made a point of stopping at the foot of every hill, and refused to proceed in spite of every punishment, were considered beyond cure, but it was suggested at last that several horses should be attached to the back of the carriage, and, being put into a trot, be made to pull the refractory horses backwards. The result was perfectly successful, for thenceforth they faced every hill at speed, and were not to be restrained till they reached the summit. A dog which had been beaten while some musk was held to its nose, always fled away whenever it accidentally smelled the drug, and was so susceptible of it, that it was used in some physiological experiments to discover whether any portion of musk had been received by the body through the organs of digestion. Another dog, which had been accidentally burnt with a Lucifer match, became angry at the sight of one, and furious if the act of lighting it was feigned. There are, besides, so many instances recorded of even higher degrees of intelligence, that it is impossible to deny that animals arrive at a knowledge of cause and effect. Strend, of Prague, had a cat on which he wished to make some experiments with an air-pump; but as soon as the creature felt the exhaustion of the air, it rapidly placed its foot on the valve, and thus stopped the action. A dog, having a great antipathy to the music of a violin, always sought to get the bow and to conceal it. The well-known story recorded by

Plutarch proves the application of accidentally acquired experience: he says, that a mule, laden with salt, fell accidentally into a stream, and having perceived that its load became thereby sensibly lightened, adopted the same contrivance afterwards purposely; and that to cure it of the trick, its panniers were filled with sponge, under which when fully saturated it could barely stagger.

Animals turn to account also the experience they derive from matters in which they individually have had no share. The more wary, which may have seen others either caught or shot, keep carefully out of the reach of all risk, as in the well-known case of the crows, which avoid the field in which a dead or wounded one is fastened, although in the latter case they hover about, attracted by its cries, but still out of harm's reach. Mice, again, however numerous, cannot be caught for any length of time in the same description of trap, which they seem to understand and to shun; and where one has been allowed to remain too long, no other will enter. Where experience does not exist, suspicion exercises great influence, and is not lulled till familiarity with strange objects removes the ground of fear. Strings stretched on little sticks over new-sown land will keep it free from birds; and feathers hung along gaps in preserves will deter the game from passing through them.

The intelligence is the most remarkable where experience seems to lead to the formation of a future plan, and to suit itself to circumstances, as in the case of the cow, which having strayed into a carelessly open granary, continued its visits by contriving to draw the bolt with its horn, till it was found necessary to change the fastening. Such newly excited actions of the mind

amount almost to invention. The arctic foxes undermine and throw down the poles on which flesh is hung to keep it out of their reach. Gleditsch saw a burying-sylph (*necrophagus humator*) engaged in burying the body of a frog through which a stick had been thrust, and finding the stick to interfere with the process, set to work and buried the stick also. A large garden spider which was constructing its web between two fruit-trees, having failed in repeated efforts to attach one of the main threads as it wished, made it at last fast to a small stone, which it raised so high from the ground, that ordinary-sized people could pass under it without touching. Halliday mentions a mason-bee, which had built its nest on a wall close to a window generally closed with a shutter, but which, when thrown back, lay so close to the wall that the nest was completely shut in; to prevent this occurrence, it formed a little lump of clay, which hindered the shutter from fitting tight to the wall, and which it renewed as often as it was removed. Jesse recounts the circumstance of some rats destroying the bladder fastened over the nose of an oil bottle, and making free with the oil by dipping their tails into it and licking it off. Dr. Pelican saw some rats engaged in the same manner round the bung-hole of a cask of wine.

The same principle of adapting a means to arrive at an end, was carried a degree further, because of a foreign agency being employed, by the dog which threw stones into a well, and the fox which dropped them into the neck of a pitcher, in order to get at the water. Thus also with the monkey which Degrandpré put to the proof, by leaving on a table an open bottle of aniseed-brandy, from which the monkey extracted with its fingers and tongue as much as it could manage

to reach, and then poured sand into the bottle till the liquor ran over.

Cuvier relates the anecdote of an ourang-outang in the Menagerie at Paris, which was in the habit of opening the door leading to a dining-room, the lock of which was out of its reach, by lowering itself from a rope fastened to the ceiling; to stop which, the cord was shortened by means of several knots, but the animal seeing the reason, and at the same time perceiving that by hanging beneath them, he drew them tighter by his weight, he climbed above them and loosened them with ease. It also unlocked a door by trying every key in a bunch till it found the right one, and if the lock was too high, it fetched a stool and mounted on it. Leuret saw a monkey escape from its cage, run through a gallery and bolt the door after it, and then conceal itself in a closet from which it first took the key. Cuvier, again, describes a monkey that drew out the claws of a cat which had scratched it. Burdach had a cat which, when it wished to leave his room, sprung on a table standing near the door, and pressing on the handle, managed to open it.

Animals often shape their conduct according to the experience they have learnt from the acts of other animals. Le Vaillant's monkey, when tired, used to jump on the backs of his dogs for a ride; but one of them, objecting to this mode of horsemanship, stood still as soon as the monkey had taken its seat, knowing that from fear of being left behind and of losing the caravan, it would immediately run off to overtake it, when the dog itself followed behind to prevent any fresh attempt. The marten will not go near a trap if it sees the impression of a man's footstep on the surrounding soil; and the fox, which recognises a trap, is

not to be enticed by the bait, but if it sees another animal caught in it, it consumes the bait as well as the animal itself. An elephant employed in the artillery service in India, perceiving that a soldier had fallen from his gun in such a position that the wheels must infallibly pass over and crush him, raised them with its trunk till the piece had gone over the man without injury. Another elephant that was exhibited in London was made to go through a variety of tricks, and among them that of picking up a sixpence with its trunk; but on one occasion the coin rolled near a wall beyond its reach. As the animal was still ordered to get it, it paused for a moment as if for consideration, and then, stretching forth its trunk to its greatest extent, blew with such force on the money that it was driven against the wall, and was brought within reach by the recoil. An officer in the Bengal army had a very fine and favourite elephant, which was supplied daily in his presence with a certain allowance of food, but being compelled to absent himself on a journey, the keeper of the beast diminished the ration of food, and the animal became daily thinner and weaker. When its master returned, the elephant exhibited the greatest signs of pleasure; the feeding time came, and the keeper laid before it the former full allowance of food, which it divided into two parts, consuming one immediately, and leaving the other untouched. The officer, knowing the sagacity of his favourite, saw immediately the fraud that had been practised, and made the man confess his crime.

A servant-maid, whose duty it was to wash a little lap-dog, walking in her sleep, set about the task; but the dog not liking the untimely bath escaped into its mistress's room, and, pulling her by the clothes, at last

induced her to follow it into the kitchen, where she found the maid with the tub and water intended for the dog.

SENSE OF SPACE.

ALTHOUGH this faculty of measuring distance, or of perceiving the exact approximity of objects, is greatly developed by experience, and carried to the greatest perfection by practice, yet it is without doubt, to some extent, almost congenital with most animals; it is an act of immediate judgment, directed by the organs either of touch or sight. Nestlings perceive early the approach of the parent birds, and clamber to the edge of their nest to obtain the expected food, and, filled early with instinctive dread, they watch the steps of an intruder, crouching down to avoid observation, and if the hand be but stretched out towards them, they topple over the side of the nest as a means of escape. The young chamois on their rocks, and the young monkeys in their woods, leap from point to point, with unfailing precision. There is no attempt, as with a child, to grasp at things far beyond its reach, nor deception as with those who gain their sight long after childhood, and imagine every object to touch the pupil.

The perception of distance is at its greatest point of perfection when the object to be either reached or avoided is itself in motion, so that a double calculation is necessary in order to judge of the relative speed of the two moving bodies, namely, of that of the individual itself, and of that which engrosses its attention. Animals form a correct estimate of the distance at which they are in danger, and birds remain perfectly quiet as

long as a certain interval of space remains between that and them. Herons watch the approach of a sportsman from afar, but if he approaches within a couple of hundred yards they take the wing. The grebe dives and does not re-appear on the surface of the water till it has placed itself in safety. The chameleon estimates the exact distance at which it can dart out its tongue and seize a fly; and, most singular of all, not only from the process itself, but from its unerring certainty, the Chætodon rostratus shoots forth its drop of water from the distance of several feet, and brings down the insect from the leaf of the water plant on which it has settled.

Predatory animals of the feline species, which lie in ambush, calculate the moment and the power of the spring they make on their prey according to the speed of its movements. If meat be thrown to a dog, it measures the fall so accurately, inclining its head this way or that according to its direction, that it seizes it before it can touch the ground. The falcon catching its prey on the wing, pursues it with the velocity of an arrow, and striking it with its breast, clutches it simultaneously with its talons. The horse in taking its leap when at its greatest speed, gathers itself for the effort at the due distance, neither blundering over it by being too near, nor falling short by rising too soon. The hare, when coursed, turns as on a pivot when it perceives the dog prompt to make its fatal rush; or aware that its speed is equal to that of its pursuer, or that it has the advantage of a start, it seeks the safety of the distant wood. These instances may be multiplied without number, and the existence of the faculty may be traced in almost every order of beings down to the smallest insect, where it acts with the same promptitude and unerring precision.

COMPUTATION OF TIME.

This faculty is perfectly unconnected with the external senses, and exhibits so completely the combination of method and judgment, that perhaps nothing in the whole animal system goes so far to prove the existence of mind; and although almost every proof has a reference in some manner to the human race, yet it is not the result of education, but of observation. The peculiarities of the season, and of the periods of migration and of hybernation, do not fall under this head, as the knowledge of them is entirely attributable to instinct, and to that impulse over which the animal has no control, affecting the young as strongly as the old. Recognition of circumstances has no influence on the judgment, for, where any variation in them takes place, the animal is bewildered and cannot reconcile it to its accustomed practice. Thus, we read of the dog, the constant companion of its master, which remained quietly at home on the Sundays, but followed him to the church on Good Friday, although to outward appearance the two days were the same. The same with the deer in Greenwich Park, which, accustomed to the crowds frequenting the spot, are so little alarmed at their appearance that they feed from the hand, but confine themselves on Sundays to an enclosure set apart for them, and never wander from its precincts; but on Good Friday, when the park is equally thronged, they remain at large. Poultry, like the pigeons at Venice, before mentioned, know the exact moment of feeding time; and domestic animals return of their own accord at the stated period from

their pasture. Robins, and other little birds, will come regularly at the hour of breakfast to receive their crumbs from the window. An ostrich, at Paris, rang a bell at the door of its enclosure when its food was not brought at the usual hour.

We are so accustomed to the presence of our dogs that we almost cease to notice their actions, but the least intelligent of them seem to be perfectly conscious of the arrival of certain periods of time. There is the well-recorded story of the Newfoundland dog which took daily a basket with sundry pence in it to the baker's, and brought back the rolls for the family's breakfast, but on the Sundays made no effort to move. The race of turnspits is almost extinct, as their services have been superseded by machinery, but in some places this has not been of long date. These dogs knew the roasting-day most distinctly. At the Jesuits' college at Flèche, the cook took one of these dogs out of its turn to put it into the wheel of the spit; but the animal giving him a severe bite ran away, and drove in from the yard the dog whose turn it really was. Arago describes something similar; he saw several dogs at an inn, whose duty it was to turn the spit in regular rotation, one of which skulked away, and obstinately refused to work, because its turn had not come round, but went willingly enough into the wheel after its comrade had turned for a few minutes. A dog, which was in the habit of accompanying its master from Paris to Charenton, where he spent the Sunday with a friend, having been locked up on two successive occasions, ran off alone to Charenton on the Saturday evening, and waited there for its master.

A gentleman writing from Edinburgh, and speaking of the Scotch shepherd's dog, describes it as one of the

most intelligent of the canine family, as a constant attendant on his master, and never leaving him except in the performance of his duty. In some districts of Scotland these animals always accompany them to church; some of them are even more regular attendants than their masters, for, by an extraordinary computation of time, they never fail resorting thither, unless employed in attending their charge. To a stranger, their appearance is somewhat remarkable in such a spot, and the propriety with which they conduct themselves during the service is remarkably singular. On one occasion, towards its close, one of the dogs showed an anxiety to get away, when his master, for this unmannerly conduct, very unceremoniously gave him a kick, which caused him to howl, and break the peace of the assembly, and, to add to his distress, some of his fellow dogs attacked him, as dogs are wont to do, when they hear one of their species howl. The quarrel became so alarming that the precentor was forced to leave his seat, and use his authority in restoring peace, which was done by means of a few kicks. All the time of this disturbance the minister seemed very little discomfited, continuing his preaching without intermission, which showed that such occurrences were not rare. In one parish great complaints were made against the disturbances occasioned during divine service by the quarrelling or otherwise unmannerly conduct of the dogs, when it was agreed that all those who had dogs should confine them, and not allow them to come to church. This did very well for the first Sunday or so; but the dogs not at all relishing to be locked up on a day when they were wont to enjoy themselves, were never to be found on the Sunday mornings to be tied up: they by some instinct knew the Sunday

as well as their masters, and set off before them, whither they had been in the habit of going on that day. It was now evident to the members of the congregation that this plan would not do, and another scheme was laid before them, which was, to erect a house close to the church in which they might be confined during divine service. This was adopted, and a kennel was accordingly built, in which the dogs were imprisoned; but the animals, being more accustomed to freedom than to confinement, took this restraint upon their liberty in ill part, and set up a most dreadful howling, to the great annoyance of the people in the church. They, however, persevered in confining them for a considerable time, thinking the animals would get accustomed to their incarceration; but in this they were mistaken, for instead of the howling diminishing, it got worse and worse. So it was agreed they should again be set at liberty, and have freedom of access to the place of public worship; but their manners had been so corrupted that they were with difficulty brought even to their former discipline.

CALCULATION OF NUMBER.

THERE is no doubt that animals possess this power, and although it cannot be ascertained whether it is shared by the lower orders, yet it is quite clear that higher ones are endowed with it to a certain extent. If we remove one of a litter during its mother's absence, she misses it on her return. A man having found some tiger cubs in the jungle, took them up and was bearing them away, but, finding he was pursued by the

tigress he dropped one, and hastened on. Having placed it in safety, she again pursued the man, when he dropped another, which she again bore off, and then continued following the man and redeeming her cubs till she had got them all. Lichtenberg says, that his nightingale could reckon up to three. He made the experiment with meal worms, giving it daily three. It hopped on its perch to devour them as it took them in succession from his fingers, and then sprang to the top of its cage. It was not from satiety, for if he enticed it by a fourth, it jumped down to receive it. Birds which lay a certain number of eggs before they begin to sit, are evidently aware when the complement is made, and hence follows one of the most remarkable and mysterious phenomena in the whole system of nature, for if we continue to remove one for many times in succession, the hen-bird will continue as often to deposit another egg, and ceases only when the number is complete. This power of producing or of withholding baffles all conjecture and investigation.

The tricks taught to dogs and pigs, of distinguishing letters and numbers, are mere deception, and do not belong to this category; an almost inaudible click of the nail, or a private and well-understood signal from the master being the guide to the performance.

MISTAKES OF INSTINCT.

The want of consciousness of the distinction between things as they really are, and as they appear to the senses, is a kind of self-deception in which the understanding, and not the senses, is at fault. Thus animals

do not recognise familiar objects in which some accidental change has taken place. The bison in the Menagerie in Paris, before alluded to, attacked its keeper, who approached it in a dress different to his accustomed one; and the daughter of the proprietor of some wild beasts at Vienna, to whom a lion had been extremely docile, permitting her even to enter its cage, was destroyed by it on her doing so in a fête dress. Dogs cannot recognise naked people; and if the accustomed voice calls to them from the water, they are bewildered. Thieves are aware of this peculiarity, and have been known to enter premises guarded by a savage dog with perfect impunity in that state. Such mistakes occur even among animals themselves; lambs do not recognise their respective dams when the ewes are fresh shorn: they hear the accustomed bleat, but run hither and thither till they recover the identity by the smell; and it is not unusual to see sheep of the same flock, deceived by their changed appearance after shearing, run and butt at each other as intruders. Some animals are deceived by artificial resemblances; the trout and salmon rise at an artificial fly, and the pike snaps greedily at the glittering metallic bait. The deer, deceived by a pair of horns held above a bush which the Indian hunter carries before him, allow him to approach within shot of his arrows. The edible frog, which rejects dead food, seizes a dead mouse if it be moved gently to give it the appearance of life; and the little green tree frog, so abundant in Germany, and of which the author kept one for several years, was fed with dead flies throughout the winter, by a similar deception. Birds are scared away from fruit trees and fresh-sown land by figures representing a human form, and are again decoyed by pipes imitating their own

peculiar cries. And in this manner many animals mistake the representation of an object for the object itself; the drawing for the original. A tame roller, at large in a room, pecked at the drawing of a locust for the actual insect; and a monkey, turning over the leaves of a work on entomology, pinched out the engravings of the different insects and devoured them. The monkey, the cat, and the dog, startled at seeing themselves reflected in a looking-glass, have been noticed to make cautious advances, as if to strange individuals of their own species, and the game-cock to throw itself into an attitude of battle.

Some animals, however, are not deceived by appearances, and, from the close examination of them, seem to doubt them; labouring by some mental process to distinguish between the contradictory impressions. The dog seeing his master in strange clothing, looks at him in vain to identify him; it hesitates, and examines him suspiciously from a distance; but leaps on him at once when it hears his voice. A tame eagle repulsed fiercely the caresses of its keeper in a new dress, but became pacified and gentle when he soothed it with his well-known voice.

In the account of that singular parasitic flower, the Rafflesia Arnoldi, it is mentioned that it smells like tainted beef; and on its discovery by Dr. Arnold, a swarm of flies was gathered round it, for the purpose, he imagined, of depositing their eggs upon it, supposing it, no doubt, to be tainted flesh; and the same thing occurs as regards the Stapelia. This is one instance in hundreds which might be enumerated, of what may be called the *mistakes of instinct*, where it depends upon the information of the senses; and, in this respect, similar mistakes frequently occur, where the higher

powers of human rationality are deceived by analogous phenomena. The fine nutty flavour of cherry-laurel water, and of prussic acid, would be certain to deceive the inexperienced; and Majendie's maid-servant actually fell an immediate victim to her desire of tasting the prussic acid which she found in his laboratory.

The common earth-worm (*Lumbricus terrestris*) is instinctively afraid of moles; and no sooner is it susceptible of any subterranean noise or movement, similar to those indicative of the approach of its enemy, than it makes a speedy escape to the surface. Every boy knows how to take advantage of this, to procure fish-baits, by thrusting a spade or stake into the ground, and moving it backwards and forwards, to imitate the advance of a burrowing mole in search of prey, when the worm, unable, with all its instinct, to discriminate between its subterranean enemy and the spade, darts into daylight. The lapwing, also, aware of this instinctive dread of the worm, when it cannot find a sufficiency of food above ground, pats the ground with its feet till the earth-worms come forth.

It is well known, when a hawk appears, that he is immediately surrounded by a host of small birds, particularly swallows, which dart at him and tease him, as if for the purpose of distracting his attention; and the cuckoo, which bears a strong resemblance to the hawk when on the wing, is certain of a similar retinue of small birds wherever it flies.

To take an example from domesticated animals, Linnæus records, in his *Lachesis Lapponica*, that at Torneo there is a meadow or bog full of water-hemlock (*Cicuta virosa*), which annually destroys from fifty to one hundred head of cattle. It seems that they eat most of it in the spring, when first turned into the

fields, partly from their eagerness for fresh pasture, and partly from their long fasting and greediness, the herbage being then short. Besides, from the immersion of the hemlock under water, it may not have the proper scent to deter them. A similar destruction of cattle from the same cause occurs in the wide meadows of Leinings.

This slight review of the perceptions and natural endowments of animals is far less than the subject deserves, but yet, perhaps, sufficient to satisfy the most unthinking and sceptical, who regard this part of the creation, if they regard it at all, as beneath their notice, that each creature, according to its wants and habits, is in its structure as complete and perfect as themselves, possessing organs of the most astonishing sensibility and refinement, and faculties which, in discrimination and adaptation, approach even the powers of reason. If the higher mental qualifications, and the greater powers of the understanding,—those, namely, of generalisation, of abstraction, of speculation, of planning, and arrangement,—are deficient, who can venture to maintain that the understanding itself does not exist? If there be a deficiency in that stretch of intellect that seeks to fathom the foundation of things, and their mutual connexion for their sake alone, to find out the reason and the consequence, the cause and the effect, it cannot be denied that their actions are regulated by design, and that they are even capable of acting beyond the point at which their instinct serves them.

SENSATION.

We are not only aware of surrounding objects, of their appearance to our bodily senses, and (as opposed to the mind) of an outward perception of them, but we also experience impressions, and the combination of feeling which these figures have awakened in us. This mental frame or embodiment is called the *sensation*.

In its first state it comes before us as an existence or individuality, and as a mere passive impression. It is feeble in its consciousness, and only comes forth boldly, with all its lights and shadows, from its former mist, when some excitement takes place, and when it assumes some distinct character, generally either of pleasure or of pain. This feeling imparts to us the knowledge of the existence of life, either generally or in certain parts; we experience the distinction of this condition of existence only when it assumes its perfect character; but its acuteness varies in each part according to the susceptibility of the nerves, and their connexion with the brain, and in proportion as the powers of life are weak or strong. Thus we experience no sensation when the intestines are in a healthy state, because the nerves with which they are furnished are only in a direct communication with the brain by means of the great nerves of the stomach; but should they be affected, we are immediately sensible of the effect, while, on the other hand, every movement and action makes us cognisant of our voluntary muscles and their powers.

In the lower scale of organic construction, sensation and perception are probably identified or combined;

the representation of an object loses itself in the sensation which it occasions; it is a kind of mental state in which the distinction is not defined.

In the common sensations of life, we perceive a distinction according as the exciting cause is agreeable or otherwise, whether it presents itself as pleasure or dislike, bodily strength or weakness, activity or fatigue, warmth or cold, by pressure or tension of the atmosphere, &c. By these combinations of sensations, all animals in which they are strongly developed are enabled to anticipate atmospherical changes before the most delicate instruments give any indication of them, and in a minor degree the same is traceable in persons of great nervous susceptibility. In the animal world it extends not only to creatures of the land and of the air, but also to those which inhabit the water. The Actiniæ throw out their feelers and expand themselves when a continuance of fine weather is to be expected, but withdraw and contract themselves, even in a room, when a change is impending. The muscles, before the approach of a storm, spin several new threads to secure their hold on the rocks; and leeches rise to the surface of the water before rain. Spiders enlarge their webs during fine weather, but spin only short threads, work seldom, or hide themselves in corners, during rain. Many beetles by their active flight and humming sounds give tokens of the morrow's brightness. Before rain, bees remain either in their hives or in the neighbourhood of them; and ants convey deep into their hills the pupæ which they expose to the sun in fine weather.

The loaches rise anxiously to the surface of the water before a storm, and hence in Germany they are called weather-fish, and are kept in glasses, where by their uneasy movements they denote a change twenty-four

hours in advance, and from the same cause many fish forsake the sea for the rivers; the groundling is roused into activity; the silurus leaves the deep waters; and the eels become lively.

If the lightning strikes the water, the perch sickens and dies; the snake and the slow-worm are restless before a storm; toads leave their concealment before rain; ducks are busily active; and swallows fly lower. Before a storm breaks forth, many birds, such as the crossbill and plover, are uneasy, and show themselves less; and while many species of water-fowl hurry for shelter to the shore, the petrel, as if rejoicing in the coming conflict of the elements, dashes forth and defies its power. If the atmosphere be lowering in the morning, pigeons feed rapidly, and return to their cots; and the hare hides itself, but the mole comes to the surface of the ground, and the squirrel seeks its nest, and shuts its entrance.

This susceptibility of atmospherical changes influences also materially the natural economy of some animals; the wild rabbit, for instance, which feeds chiefly in the evening or at night, comes forth at noonday, if the weather portends rain, and loses its natural timidity in its eagerness to procure food. Before the occurrence of an earthquake, animals become uneasy. In that which took place in Calabria in 1783, it was noticed by Bartel that the sea-fish were disturbed, and were taken in vast numbers; many birds fluttered about distressed in the air; dogs ran about howling; the horses and oxen trembled, pawing the ground, and snorting as if in agony; and the cats slunk about with their hair bristled up.

TONE AND POWER OF SENSATION.

Local or organic sensation is more acute than that of a general character; and its tone is necessarily stronger. Thus the sensations of the organs of food denote hunger or thirst, refreshment or appeasement, repletion or nausea; of those of motion betray activity or fatigue; of those of the senses betoken dread of light, uneasiness at colours, of sounds, smells and perfumes, pleasant and unpleasant tastes, of hurts, wounds, tickling, local pains, &c. The general tone of the animated frame, of the impressions on the senses, and of the ideas, is of an entirely independent character.

The living principle, proceeding from bodily and physical relations, possesses a most material influence; as connected with the former, it is the preponderance of the nervous system, and of the brain, occasioned by stimulating food, powerful respiration and circulation; with the latter it is an easy excitability.

Another operating cause is to be traced in the impressions on the senses, particularly in those of the highest character. Thus light produces in some animals an agreeable, and in others a disagreeable sensation; and hence follows the general law, that such animals as live beneath the earth's surface, or in gloomy places, as well as those which prey by night, avoid the light. The majority of animals are, however, agreeably affected by the light, and appear to seek it; most of the mammalia are fond of basking in it; singing birds are mute and spiritless on gloomy days, but resume their joyous notes with the first gleam of sunshine; even many aquatic

animals, such as crabs, fish, frogs, and seals, are attracted by light, and the blaze of fire. Not only light in general, but its modifications, and particularly colours, produce an effect on animals. Oxen, buffalos, and turkeys, are especially excited, and often furious at the appearance of anything red. It is stated that the vulture, the rhinoceros, and the alligator, attack people clothed in red; and it is even asserted, that salmon forsake their spawning grounds if they perceive any red object on the shore. The bull-fighters in Spain use little red flags to excite and infuriate the animals they combat.

It has been already stated that many sounds are pleasing to animals, as proved by their following them; that the voice or cry of its own species is agreeable is shown by the attractive power of a decoy note; and it appears from the energy of some singing-birds, that they are delighted with the sound of their own melody. The mocking-bird of America is described as throwing itself into certain gestures, as if entranced with its own notes.

The camel of Southern Asia is roused from its fatigue to new exertions by the music of its drivers; and if it refuses to suckle its young, the Mongols excite it by a plaintive note, having some resemblance to the cry of its foal. Some sounds, however, create the most unpleasant sensations. There are some horses to which the sound of a drum and the discharge of a fire-arm is insupportable; affecting the pulsation of the heart, and making them to fall as in a fit, from the sudden action of the blood on the brain. There exists also an idiosyncracy against certain sounds, as against certain colours; thus many peeple experience the most disagreeable sensations at the rustling of silk, the scraping of a knife

on a plate, and the ringing of musical glasses. In the same manner the high notes of a violin, or the discordant sound made by passing a wet finger across a glass, are positively painful to some dogs; they howl, tremble, and try to escape. A polecat became so exasperated at the sound of sharpening a knife on a whetstone, that it flew at the man employed.

The perceptions of smell produce also a great variety of impressions. The Giraffe refuses milk, if the vessel or the hand which holds it is infected with the least smell. One of the same animals would lick the hands of women who caressed it, but not those of men. Harwood's goat refused to touch grapes upon which he had breathed, selecting those on which the breath had not passed. Some dogs, and horses in general, have a strong aversion to slaughter-houses; the latter wind carrion at an immense distance, and will bolt rather than pass it. Like all other herbivorous animals as regards the odour of animal substance, they have an equally strong dislike to the smell of fresh meat, and it is only by custom that butchers can bring them to their work, and this equally applies to tanners.

There are causes, bearing so strong an affinity to what, humanly speaking, we call ideas, that language knows no distinction, and they possess, besides, a great influence on the sensations of animals, as exemplified in our domestic ones; and particularly in the horse, which, however jaded by its work, pricks up its ears and enlivens its pace as it approaches its home, and knows that the season of food and rest is at hand.

The tone of the sensations is of a relative nature in one and the same species of animals, as in different human beings, inasmuch as it is regulated by controlling circumstances; as for instance, in a sick animal which

rejects its favourite food. The sensations of animals, as in man, become also indifferent and blunted from sameness. However keen an animal may be at first after some tempting food, it will, from habit, grow totally indifferent to it. This is equally the case with sensations, unpleasant at first, but which are reconciled by custom, as in the horse, which ceases to dread the clang of trumpets and the roar of artillery. But the strength of the sensations is materially affected by age, sex, and temperament. The healthy tone of the sensations declares itself by a quickened circulation, an increased muscular power, a brightness of the eye, and a cheerful voice; the reverse is felt by a languid pulse, a disinclination to movement, a dejection of the head, a lassitude of the joints, by a sadness of expression, and often by a mournful and plaintive voice.

SYMPATHY.

SYMPATHY is a strong and lively emotion acting on the the passions. It varies in its effect according to the tone or quality of the sensations, exciting either agreeable or disagreeable emotions of joy or pain, and in proportion to the excitability of the nervous system, it is either tumultuous or calm, exhibiting either anger or fear.

As sympathy derives its sources from the excitable temperament of the mind, it exists only in animals of lively habits, while those of a dull nature pass their lives in a comparative state of apathy. It speaks in the look, in the manner, in the voice, and even in the move-

ments of the body. In some animals its expression is denoted by the particular movement of one member or part of the body; thus the ears of a horse, the back of the cat, the tail of the lion, the proboscis of the elephant, all express its presence in different ways. The frightened dog thrusts its tail between its legs, &c.

JOY.

Joy, like a sunbeam, enlivens the existence of animals; and their susceptibility to its influence, particularly as regards the domesticated races, alleviates the yoke of labour, and even stimulates them in its performance.

Who, in going abroad in the early morning, when the rising sun is awakening the slumbering world, has not been sensible of a gladness of sound. The springs of life are touched, and all awaken to new existence and action. The cricket chirps, the grasshopper springs rustling over the sunny banks, and myriads of other insects, leaving their hiding-places, fly buzzing through the fresh and fragrant air; thousands of voices are awakened in the woods, and high aloft the lark is warbling forth its hymn of praise. In all creation the stamp of joy is visible, in which even the inanimate portion seems to take a share:

> "Forth in the pleasing spring
> Thy beauty walks, thy tenderness and love.
> Wide flush the fields; the softening air is balm;
> Echo the mountains round; the forest smiles;
> And every sense and every heart is *joy*.—Thomson.

It is more especially by the voice that the tumult of

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joy is expressed. Among the insect tribes it is thrilling in the cicadæ and locusts; and among amphibiæ, the frogs raise a chorus on still, warm evenings, which fills the air, now veiled with a thin gauze-like mist rising from their haunts. But it is in birds, and particularly in those of song, that their ecstacy is the most eloquent, whether when careering in the air, shooting through it in all directions with the rapidity of an arrow, or wheeling high aloft in mazy circles, like the rooks in the bright evenings of summer: these, the brightest ornaments of the creation to whom the sun gives life, are not only emblems of joy in themselves, but produce it in others. Among mammalia, also, the effect is strongly marked. The horse neighs and snorts with delight when it rejoins its companion, and the dog is tumultuous in its joy when it sees its master. Savage animals in confinement have recognised, after an interval of years, the persons of those who have reared and fed them, and have exhibited the most marked symptoms of joy, of which Bingley gives some very interesting anecdotes.

The expression of joy is not confined to animals in their voice, but shows itself also in the general movement of the body. Little, if any, is perceptible in the expression of the face, and, according to Grant, the ourang-outang performs its antics with the gravity of a philosopher. An approach to laughter is only visible in those monkeys which bear the greatest resemblance to the human form. The ourang-outang, when tickled, draws down the angles of its mouth and grins, uttering at the same time a grunting sound. The chimpanzee titters almost like a human being. But joy is not in all cases connected with the outward senses; it is confined, in the lower classes of animals particularly, to the gratification of the appetite; and in these it is found

only as a sensual feeling, which no other excitement can awaken.* M. D'Obsonvillè, in the East Indies, kept an elk, from twelve days old, for two years. It always came when he called it. Leaving Sumatra, he gave it to Mr. Law, in whose country-house, being chained and alone, it became furious and dangerous. Some months afterwards, D'Obsonville returned, and went to it. "It knew me afar off. I ran to meet it; and shall never forget the impression of its transports and caresses."

† Sir George Davis had brought up a lion from a whelp, and at five years old parted with it, as it began to be mischievous. Three years afterwards, he saw it in the Grand Duke's menagerie at Florence. Though then fierce to others, when Sir George appeared at the gate, the animal remembered him, reared up, and licked his hands. He entered its den, and the lion threw its paws upon his shoulders, licked his face, and ran about the place, fawning, and as full of joy as a dog at the sight of his master.

A bullfinch kept by a lady, became extremely attached to her. Her presence created a sunshine to him, and he sung and rejoiced with his whole heart when she was by, while he drooped in her absence, and would sit silent in his cage for whole days together. The lady fell sick, and was confined to her bed for a week with so severe an illness as to be entirely disabled from thinking of the bird. At length, when she was sufficiently recovered to see him, she ordered his cage to be brought, and set upon the bed beside her. The bird knew her voice in an instant, though it was weak and low from fever. The cage-door was opened; he uttered a shrill cry of joy, between a song and a scream, fluttered from her hand to her cheek, and fell dead.

* Bingley. † Idem.

PAIN.

This sensation can only be slight in the lower ranges of animal life; for if it bore any proportion to the violence to which these classes are subject, it is impossible to conceive how the polypi and many species of worms could endure such multitudinous injuries without perishing. The polypi can be drawn back like a glove, cut in pieces, and pounded in a mortar, and yet live. The Naides can be severed into many parts, each of which will form a separate animal, and the Medusæ, if deprived of a large portion of their bodies, will replace it, and live. It would thus appear that where nature has assigned so great a tenacity of life, and such slight powers of sensibility, the amount of pain must be proportionably small, as pain in its intensity acts prejudicially to life.

This tenacity of life is less in the Infusoria and the Wheel animalculæ. Pressure destroys the latter; the smallest quantity of spirits of wine, or of acid, affects them, and if the measure be increased, it kills them; the least proportion of poison is sufficient to destroy them; and an infusion of strychnine added to a drop of water, is fatal to them, causing convulsions as in the superior animals.

The Molluscæ contract themselves with a spasmodic action, if touched with violence, and the trodden worm writhes in agony.

The assertion is altogether groundless, that insects experience no sensations of pain although transfixed with a pin, around which even a slight deposit of verdigris collects, and left till they perish from hunger; for

although in all probability they do not suffer pain during the latter period, there is no doubt but they feel acutely at the moment of the transfixion. It is only necessary to watch the effect when a needle is thrust through the back of an insect, and it will be obvious that it makes many powerful and convulsive movements, indicative of pain, and not of struggles for escape. Butterflies pierced with a common pin, exhibit these symptoms, and the spasms are repeated if a heated pin be afterwards introduced. But still, as said before, much depends on the perfection of the organisation; and besides, the formation of insects is so peculiar to themselves, that we have no parallel in any of the other classes. Some of the animals in the class *Vermes*, may be cut and divided almost *ad infinitum*, and each part will eventually become a perfect animal. Some insects without this reproductive power, will bear dividing, and still continue to live, and perform most of the various functions with which they are endowed. The common dragon-fly (*Libellula varia*) will live for days without its head; and if, instead of the head, the abdomen be taken away, the animal seems to feel no material injury. This insect is of a most voracious nature, and has been known to feed under the following extraordinary circumstances:—A gentleman being engaged in collecting insects, caught a specimen of the common dragon-fly, which he fastened down in his collecting-box, with a large pin thrust through its thorax, when, to his astonishment, he observed the dragon-fly held in its forceps a fly, which was still struggling for liberty. This it soon devoured, without exhibiting any sign of pain, seeming wholly unconscious of its own unpleasant situation, being still secured by the pin before named to a piece of cork. When the fly was devoured, the insect began to flutter, and made

several attempts to regain its liberty. The gentleman, greatly surprised at this incident, and willing to improve the experiment still further, caught another fly, which he offered to it. This was eagerly seized by the rapacious insect, and devoured with greediness; and when its meal was finished, it began to flutter again as before. It certainly is not derogating from the benevolence so conspicuous in all the works of Providence, to conceive it probable that it has, with infinite wisdom, withheld from some of the lower classes of animals that degree of sensation so abundantly dispensed to others filling the higher ranks of creation; as from the habits necessarily entailed upon them, they are more likely to encounter accidents that tend to mutilate, than other individuals of higher powers of sensation. Thus we often see the earth-worm an object of contention between two birds, neither of which is willing to part with its prize, and in the scuffle the worm is frequently separated into three parts, each of the birds flying away with a portion, and leaving the centre part of the animal behind, which, if the situation where it is left be moist and sheltered, begins in a few days to repair its loss, and in a short time restores its deficient parts; or if a worm be divided into two pieces, they will each in a short time, under favourable circumstances, become perfect animals.

Now insects, the constant food, and the objects of almost unremitting search, by such a variety of animals, had they the acuteness of feeling supposed generally to exist in all animated bodies, their lives must be a continued round of pain and watchfulness; not that it is possible to conceive, as we see from the writhings of a severed worm, that they are destitute of feeling, but their sense of pain is so blunted, as not to be of the nature generally understood by that term. That it

is consistent with the beneficence of Almighty wisdom that these, his creatures, should experience pleasure we feel convinced; and with that mercy, so benevolently extended to all his works, he has kept them from experiencing those painful sensations which their rank in creation would subject them to, if possessed of the sensibility so evident in the mammiferous class.

The expression of pain is more marked than that of joy in the features of animals; and extends in some even to the shedding of tears. This has been noticed in the seal; the giraffe, if separated from its companion, and the camel, if deprived of its foal, weep profusely; the elephant, and several of the monkey tribe, shed tears, and the horse particularly so, when violently excited or in suffering.

ANGER.

Fear and anger are not, properly speaking, independent feelings, but are rather the effects of a certain state of the mind.

Anger is a sympathetic expression of the mind, called forth by some violence or opposition done to the feelings; and being bound up with a burning desire to remove or revenge the cause, goes beyond mere feeling, by having the satisfaction of an object in view.

In the lower classes of animals it exists in full force, and is not unusually attended with fear. The larva of the ant-lion struck gently, and without injury, with a stick, flies for shelter to its hole, but driven from thence it becomes enraged, and attempts to seize the stick with

its forceps. In the same manner the anger of a snake is not unmixed with fear: if its passage be impeded, it elevates its body, hissing, and projecting its forked tongue. If lizards be driven into a corner, from which there is no escape, they threaten with open jaws, and the large green variety will try to fasten on a dog.

Many birds also become violently angry, on any attempt to touch them. The owl, on the appearance of any unusual object, ruffles its feathers, and hisses and snaps with its bill. Birds of prey, herons and bitterns, defend themselves fiercely in the same way, and even the defenceless goose runs hissing after intruders, when accompanied by its young. Robins and humming-birds are particularly remarkable for their anger and pugnacity against their own species, if they cross their path.

Among the mammalia the beasts of prey are the most subject to fits of rage. If a tiger be wounded in its flight, it springs furiously on its pursuers, and only relinquishes its attack with its life. The rhinoceros, with its head couched, and its horn brushing the ground, rushes madly on its opponent; and how fearful must be the engagement between two wild animals encountering in their rage!

The following incident, illustrative of the anger of the elephant, occurred at Delgoa Bay.* A party of officers and men belonging to H. M. Ship Leven, had been hunting hippopotami, and were returning along the banks of the river, when a rustling, as if of a hippopotamus, was heard amongst the reeds. Two of the officers, Messrs. Arlett and Barette, entered them, with a view of driving it out; the former gentleman was a little in advance, and eager in pursuit, when he was

* Owen's Voyages.

heard loudly to exclaim, "Here he is!" The shrill, angry scream of some large animal instantly followed, and in a few seconds, Mr. Barette rushed out with his face covered with blood, and calling loudly for assistance, as Lieut. Arlett was attacked and thrown down by an elephant. The party were immediately on the alert, in search of the unfortunate officer, whom they expected to find a mangled corpse. As they approached, the elephant, alarmed at the numbers, retreated, leaving his victim on the ground in a state hardly to be described. He was stretched motionless on his back, covered with blood and dirt, and his eyes starting from their sockets, in all the expressive horror of a violent death.

Every attention was paid to him, but it was long feared that life had fled. Some water was procured, when, after his face had been washed, and a little introduced into his mouth, he showed symptoms of returning life; but it was some time before he recovered his senses, and became sufficiently collected to give a connected account of the occurrence. It appeared that, from the thickness of the reeds, he was close to the animal before he was at all aware of his situation, but immediately on making the discovery, he uttered the exclamation already mentioned. This had hardly escaped him, when he discovered that, instead of a hippopotamus, he was almost tumbling over an enormous elephant. The animal, which appeared highly irritated at the intrusion, waved its trunk in the air, and the moment he spoke, reared upon its hind legs, turned short round, and with a shrill, passionate cry, rushed after him, bearing down the opposing reeds in his way, while Lieut. Arlett vainly attempted to effect his escape. For a short time he had hopes of evading his pursuer, as the animal perceived one of the seamen

mounted on the top of a tree, about twenty feet high, and three in girth, menacing him by his voice and gestures, while preparing to fire. The elephant turned short round, and shrieking with rage, made a kind of spring against the tree, as if to reach the object of its attack, when its ponderous weight bore the whole to the ground, but fortunately without hurting the man, who slipped among the reeds. The ferocious animal still followed, foaming with rage, to the rising bank of the river; the, man crying loudly, "An elephant, an elephant!" until closely pressed by his pursuer, they both came upon the top of the slope, when the party who had heard his cries were prepared, and instantly fired a volley as the elephant appeared. This made him return with ten-fold fury to Mr. Arlett, who in his eagerness to escape, stumbled and fell, the huge beast running over him and severely bruising his ankle.

As soon as he had passed, Mr. Arlett arose, and, limping with pain, attempted once more to retreat, but the animal returned to the attack; his trunk was flourished in the air, and the next moment the unfortunate officer was struck senseless to the ground. On recovering himself, his situation appeared hopeless, his huge antagonist standing over him, chafing, and screaming with rage, pounding the earth with his feet, and ploughing it with his tusks. When the party first saw them, Mr. Arlett was lying between the elephant's legs, and had it been the intention of the animal to destroy him, the placing a foot upon his body would in a moment have crushed him to atoms.

Less intelligent animals, like the boar, dash blindly in their rage on the nearest person to them, while those with greater powers of instinct, distinguish and select the object of their vengeance.

Animals of the most peaceful habits, like the marmot and the hare, give way to occasional bursts of rage; and the bat threatens with extended jaws and a sharp cry.

Anger is much modified, according to age, temperament, sex, and nature. Males in general, carnivorous animals, and such as are of a hasty disposition; and in the fulness of strength, are the most prone to anger.

In some animals, the passion has no existence, as in pigeons and sheep, which submit passively to everything which may be done to them, without even uttering a sound; but in these instances, the feelings of fear predominate over all others.

The display of the passions in animals in their wild and native state, has in it something both terrible and majestic, to which hardly any description can do justice. *An American colonist says, that sitting one day in a secluded shady spot, his attention was engaged by a strange sort of rustling noise at some paces distant, and looking round, he beheld two snakes of considerable length, the one pursuing the other with great celerity through a hemp stubble-field. The aggressor was of the black kind, six feet long; the fugitive was a water-snake, nearly of equal dimensions. They soon met, and in the fury of their first encounter, appeared in an instant firmly twisted together, and whilst their united tails beat the ground, they tried with open jaws to lacerate each other. Their heads were compressed to a very small size; their eyes flashed fire; and after this conflict had lasted about five minutes, the second found means to disengage itself from the first, and hurried towards a ditch. Its antagonist instantly

* Bingley.

assumed a new posture, and half creeping, half erect, with a majestic mien, overtook and attacked the other again, which placed itself in a similar attitude, and prepared to resist. The scene was uncommon and beautiful, for thus opposed, they fought with their jaws, biting each other with the utmost rage; but notwithstanding this appearance of mutual courage and fury, the water-snake still seemed desirous of retreating towards the ditch, its natural element. This was no sooner perceived by the keen-eyed black one, than, twisting its tail twice round a stalk of hemp, and seizing its adversary by the throat, not by means of its jaws, but by twisting its own neck twice round that of the water-snake, he pulled it back from the ditch. To prevent a defeat, the latter took hold likewise of a stalk on the bank, and by the acquisition of that point of resistance, became a match for his fierce antagonist. Strange was this to behold: two great snakes strongly adhering to the ground, mutually fastened together by means of the convolutions which lashed them to each other, and stretched at their full length, they pulled, but pulled in vain; and, in the moments of greatest exertion, that part of their bodies which was entwined, seemed extremely small, while the rest appeared inflated, and now and then convulsed with strong undulations, rapidly following each other. Their eyes appeared on fire, and ready to start out of their heads. At one time the conflict seemed decided; the water-snake bent itself into great folds, and by that operation rendered the other more than commonly out-stretched: the next minute the new struggles of the black one gained an unexpected superiority; it acquired two great folds likewise, which necessarily extended the body of its adversary, in proportion as it had contracted its own.

These efforts were alternate, victory seemed doubtful, inclining sometimes to one side, sometimes to the other; until at last the stalk to which the black snake was fastened, suddenly gave way, and in consequence of this accident, they both plunged into the ditch. The water did not extinguish their vindictive rage, and they soon re-appeared on the surface, twisted together, as in their first onset; but the black snake seemed to retain its wonted superiority, for its head was exactly fixed above that of the other, which it incessantly pressed down under the water, until it stifled and sunk. The victor no sooner perceived its enemy incapable of further resistance, than abandoning it to the current, it returned to the shore and disappeared.

A racoon having been one day lashed by a servant, would never forgive him. Neither eggs nor fish, of which he was very fond, would appease it. Whenever the man approached, its eyes kindled; it endeavoured to spring at him; uttered mournful cries, and refused every thing, until the servant went away. In the Menagerie at Paris, a terrific combat arose between two black bears, confined together in one of the sunk fosses, and which at length terminated in favour of the strongest who, after strangling his comrade, literally tore him to pieces. Guinea-pigs are extremely irascible, and their means of fighting is both singular and ridiculous. One of them seizes the neck of its antagonist with its teeth, and attempts to tear the hair from it. In the mean time, the other turns his posterior to his enemy, kicks up behind like a horse, and, by way of retaliation, scratches the sides of his opponent with his hinder claws, in such a manner that both are frequently covered with blood.

The savage and treacherous disposition of the Cape buffalo render him particularly dangerous. He fre-

quently conceals himself among trees, and there stands lurking till some unfortunate passenger comes by, when the animal at once rushes out into the road, and attacks the traveller, who has no chance to escape but by climbing up a tree, if he is fortunate enough to be near one. Flight is of no avail: he is speedily overtaken by the furious beast, which not content with throwing him down and killing him, stands over him even for a long time afterwards, trampling him with his hoofs, and crushing him with his knees; and not only mangles and tears the body to pieces with his horns and teeth, but likewise strips off the skin, by licking it with his tongue. Nor does he perform all this at once, but often retires to some distance from the body, and returns with savage ferocity to gratify afresh his cruel inclinations.

As Professor Thunberg was travelling in Caffraria, he and his companions had just entered a wood, when they discovered a large old male buffalo, lying quite alone, in a spot that for the space of a few square yards was free from bushes. The animal no sooner saw the guide, who went first, than, with a terrible roar, he rushed upon him. The fellow turned his horse short round behind a large tree, and the buffalo rushed forward to the next man, and gored his horse so dreadfully in the belly, that it died soon after. These two climbed into trees, and the furious animal made his way towards the rest, of whom the professor was one, who were approaching, but at some distance. A horse without a rider was in the front; as soon as the buffalo saw him, he became more outrageous than before, and attacked him with such fury, that he not only drove his horns into the horse's breast, but even out again through the very saddle. The horse was thrown to the ground with such excessive violence, that he instantly died, and many of

his bones were found broken. Just at this moment the professor happened to come up, but from the narrowness of the path, having no room to turn round, he was glad to abandon his horse, and take refuge in a tree. The buffalo had, however, finished; for after the destruction of the second horse, he turned suddenly round, and galloped away. Some Europeans at the Cape once chased a buffalo, and having driven him into a narrow place, he turned round, and instantly pushed at one of his pursuers, who had on a red waistcoat. The man, to save his life, ran to the water, plunged in, and swam off: the animal followed him so closely, that the poor fellow had no alternative but that of diving. He dipped overhead, and the buffalo losing sight of him, swam on towards the opposite shore, three miles distant.

At Liverpool, as a carter was altering the bearing reins of the chain-horse of his lorry, the animal suddenly struck him to the ground with his fore foot, and before he could recover himself, seized him with his teeth and lifted him into the air. His clothes gave way, and he was rescued from his perilous situation and conveyed home, fortunately with no other injury than some severe bruises. It was some time before the infuriated beast could be either approached or appeased. It was stated that this horse, about three years before, had killed a driver in a similar manner.

FEAR.

Fear has its origin chiefly from some sudden and unusual impression on the senses; and when they are so violently acted upon, that the active powers are not only shaken, but are even palsied, the feeling becomes one of terror, and thus animals, as if paralysed and helpless, stand rooted to the earth. Fear, as well as anger, have the greatest influence on the lives of animals, as aids and excitements for their preservation; the latter urges them to offer resistance to violence and attacks, and the former impels them to shun a threatened danger by flight, which terror disqualifies them from attempting, and therefore has a fatal influence on their safety and lives.

The fear inspired by ferocious animals is universally felt: the otherwise courageous elephant dreads the tiger, even when it is dead, and cannot readily be induced to carry one, particularly if in attack the beast has made a spring on its back; this dread is not altogether dependent on experience, for oxen and horses brought from countries where no lions are found, become restless and uneasy, when one approaches the encampment in the night. Le Vaillant gives many interesting statements to this effect in his African expeditions, and often ascribes the safety of his camp to the exquisite scent of the cattle of his teams, for there can be no doubt, as he expresses, but that all savage animals emit a powerful smell. Mules also cannot tolerate the smell of a dead tiger, but bolt and fly in

all directions, and according to a Hottentot declaration, the fat of a jaguar smeared on the trees, will drive foxes and other animals out of a district. A dog brought up to the newly-flayed skin of a lion, trembled violently, bristled up its hair, and drew its tail between its legs, and, when its first alarm had subsided, it fled away, and could by no inducements be brought back. Poultry and pigeons forsake their stalls, if a martin has recently visited them; and rabbits run wildly about their shed if the fresh taint of a fox is perceptible.

Many animals are so extremely timid that they are alarmed at the slightest cause, and this occurs especially with birds: the peewit shrinks even at the rustle or passing flight of another bird, and all birds crouch and attempt to conceal themselves on the appearance of those of prey. The turkey, as well in the wild as in the tame state, utters on such occasions a peculiar note, and its whole brood disperses and conceals itself among the long grass and leaves. They even stretch themselves at full length upon the ground, and continue motionless as if dead, and in the mean time the mother with her eyes directed upwards, continues crying. On looking up in the direction in which she seemed to gaze, the author has discovered a black spot just under the clouds, but was unable at first to determine what it was; however, it soon appeared to be a bird of prey, though at first at too great a distance to be distinguished. He has seen one of these animals continue in this agitated state, and her whole brood pinned down, as it were, to the ground for an hour together, whilst their formidable foe has taken his circuits, has mounted, and hovered directly over their heads; at last, upon his disappearing, the parent changed her note, and sent forth another cry, which in an instant gave life to the

whole trembling tribe, and they all flocked round her with expressions of pleasure, as if conscious of their happy escape from danger. Some animals, like snakes, are held in universal dread, and not the least terrible is the effect produced by the rattle-snake. Mr. Pennant says, that this snake will frequently lie at the bottom of a tree on which a squirrel is seated. He fixes his eyes on the animal, and from that moment it cannot escape: it begins a doleful outcry, which is so well known that a passer by, on hearing it, immediately knows that a snake is present. The squirrel runs up the tree a little way, comes down again, then goes up and afterwards comes still lower. The snake continues at the bottom of the tree, with its eyes fixed on the squirrel, and his attention is so entirely taken up, that a person accidentally approaching may make a considerable noise, without so much as the snake's turning about. The squirrel comes lower, and at last leaps down to the snake, whose mouth is already distended for its reception. Le Vaillant confirms this fascinating terror, by a scene he witnessed. He saw on the branch of a tree a species of shrike, trembling as if in convulsions, and at the distance of nearly four feet, on another branch, a large species of snake, that was lying with outstretched neck and fiery eyes, gazing steadily at the poor animal. The agony of the bird was so great that it was deprived of the power of moving away, and when one of the party killed the snake, it was found dead upon the spot—and that entirely from fear—for, on examination, it appeared not to have received the slightest wound. The same traveller adds, that a short time afterwards he observed a small mouse in similar agonising convulsions, about two yards from a snake, whose eyes were intently fixed upon it; and on frighten-

ing away the reptile, and taking up the mouse, it expired in his hand.

Terror depends materially on the nervous temperament of the creature, and the greater its excitability, the more powerful its effect. Darwin mentions a canary bird, which fell into convulsions whenever the drawer of its cage was removed to be cleaned. Horses, confined in a stable connected with premises in a blaze of fire, are so overwhelmed with terror that neither force nor encouragement can induce them to face the element and be led into safety. A herd of reindeer surrounded by hunters, or surprised by one individual, in a spot where there is an echo, are so alarmed at the report of the fire-arms on every side, that they are unequal to flight, and are all slaughtered with ease.

Among the lower animals the lobster is remarkably affected with fear, its claws dropping off at the sound of thunder or the discharge of a cannon. Innumerable instances may be quoted in support of the paralysing influence of this feeling, the violence of which can be measured by no rule, since we know that in the human race it is sufficient to turn one man's hair white, and to reduce another to a state of idiotcy.

But the effect of the human eye on animals, and the terror it produces is not one of the least extraordinary facts connected with this subject. The ferocity of the Bengal tiger is subdued by it, and the lion is particularly unwilling to encounter man when he crosses him in the full blaze of day. Captain Head in his "Journey across the Pampas," says that, "the fear which all wild animals in America have of man is very singularly seen in the Pampas. I often rode towards the ostriches (?) and zamas, crouching under the opposite side of my horse's neck; but I always found, that

although they would allow any loose horse to approach them, they, even when young, ran from me, though little of my figure was visible; and when one saw them all enjoying themselves in such full liberty, it was at first not pleasing to observe that one's appearance was everywhere a signal to them that they should fly from their enemy. Yet it is by this fear that 'man hath dominion over the beasts of the field,' and there is no animal in South America that does not acknowledge this instinctive feeling." He adds, that a native was out trying to shoot some wild ducks, and in order to approach them unperceived, he put the corner of his poncho over his head, and crawling along the ground upon his hands and knees, the poncho not only covered his body, but trailed along the ground behind him. As he was thus creeping by a large bush of reeds, he heard a loud, sudden noise, between a bark and a roar: he felt something heavy strike his feet, and instantly jumping up, he saw, to his astonishment, a large puma, actually standing on his poncho. The man was unwilling to fire, as his gun was only loaded with small shot: and he therefore remained motionless, the lion standing on his poucho for many seconds: at last the creature turned away its head, and walking very slowly away about ten yards, it stopped and turned again: the man still maintained his ground, upon which the beast tacitly acknowledged his supremacy, and walked off. A party in India were once saved from a tiger, by a lady opening an umbrella in its face as she saw it about to spring.

The lion of Africa lives in the plains, and is always found where there are large herds of antelopes and quaggas feeding together. To all these animals he is an object of unceasing dread. It is supposed by the

agitation which oxen display when a lion is near them, that they can scent him at a considerable distance. Whatever may be his physical strength, which is prodigious, it is evident he could not accomplish his purposes by strength alone. The instinctive fear of the creatures upon which he preys would be constantly called into action, by their keen sight and acute scent; and as they would remove to some distant part before the destroyer could reach them, he therefore creeps on them, or, for a short distance, advances rapidly by great bounds. His roar is a sound of terror, and produces an appalling effect. The instant it is heard by the animals reposing in the plains, they start up with alarm, and fly in all directions.

Ferocious animals are, however, themselves susceptible of fear under peculiar, and, to them, unaccountable circumstances. Dr. Sparrman relates a story of the spotted hyæna, to this effect. He says:—"One night, at a feast near the Cape, a trumpeter, who had got himself well filled with liquor, was carried out of doors in order to cool and sober him. The scent of him soon attracted an hyæna, which threw him on its back, and carried him away, thinking him a corpse, and, consequently, a fair prize, towards Table Mountain. In the meantime, however, the drunken musician awaked, sufficiently sensible to know the danger of his situation, and to sound the alarm with his trumpet, which he carried fastened to his side. The beast, as may easily be imagined, was not less frightened in its turn."

Captain Basil Hall, in his "Fragments of Voyages and Travels," gives the following anecdote of a tiger kept at the British Residency at Calcutta:—"But what annoyed him far more than our poking him up with a stick, or tantalising him with shins of beef or legs of

mutton, was introducing a mouse into his cage. No fine lady ever exhibited more terror at the sight of a spider, than this magnificent royal tiger betrayed on seeing a mouse. Our mischievous plan was to tie the little animal by a string to the end of a long pole, and thrust it close to the tiger's nose. The moment he saw it, he leaped to the opposite side; and when the mouse was made to run near him, he jammed himself into a corner, and stood trembling and roaring in such an ecstacy of fear, that we were always obliged to desist in pity to the poor brute. Sometimes we insisted on his passing over the spot where the unconscious little mouse ran backwards and forwards. For a long time, however, we could not get him to move; till at length, I believe by the help of a squib, we obliged him to start; but instead of pacing leisurely across his den, or of making a detour to avoid the object of his alarm, he generally took a kind of flying leap, so high as nearly to bring his back in contact with the roof of his cage."

Captain Alexander, whose work has been before referred to, says that a stout negro, who belonged to a friend of his, brought in from the bush two rattlesnakes in a box. He seemed to have completely subdued them by intimidation; and, after a time, he would let them out in the verandah, and they would return to him at his call. One day they were missing, and the negro's master going to an outhouse, saw them coiled up under the step of the door. He was a long time imprisoned, but at last plucked up courage, and sprang into the open air over them. The negro went out with his box to catch them: "Ah! you damn rascal, you go away! Get in house this minute." And the reptiles obeyed him! &c.

The human hair appears to be totally without sensi-

bility; nevertheless, the passions have over it such influence, that the heads of people have turned white the night before execution. The French Revolution which produced in abundance the extremes of human suffering, furnished many authentic instances of persons that grew hoary in the space of a few days. Grief, as in the memorable history of Marie Antoinette, turned her hair grey in the space of one night; and terror, as in the case of a working man at York, produced the same effect instantaneously. This man was engaged in repairing the roof of a lofty building, when the ladder broke beneath him; he clutched at the gutter, and hung from it by one hand; assistance was rapidly brought, and he was saved before his strength failed him, but when he reached the ground his hair was perfectly white.

By whatever process this extraordinary change is effected, it is most certain that it is in full force as regards the feathers of birds; for although not instantaneous in its operation, the action has taken place, and the result is shown when the season of moulting arrives. Dr. Young, in the "Edinburgh Geographical Journal," in speaking of the change of colour in the plumage of birds from fear, says:—"A blackbird had been surprised in its cage by a cat. When it was relieved, it was found lying on its back, and quite wet with sweat. The feathers fell off, and were renewed, but the new ones were perfectly white. A gray linnet happened to raise its feathers at a man who was drunk. He instantly tore the creature from its cage, and plucked off all its feathers. The poor animal survived the outrage, and had its feathers replaced, but they were also white."

ASTONISHMENT.

This feeling operates slightly, in comparison to the former, on the nervous system and bodily powers. It arises from the appearance of something previously unseen, or whose properties are unknown, and of anything of an unexpected and unusual nature. Few animals, and, indeed, none but the most intelligent, are capable of feeling astonishment. The lower and less endowed are indifferent to everything which does not endanger their safety and rest, or their means of subsistence; for their estimation of things not necessary to their habits, is hardly possible from the limited development of their powers.

It is probably first found in birds. Cranes, in their migrations, have been seen to be attracted by a fire, and to hover round it with loud screams. Among domestic animals, the cow is extremely susceptible of the feeling on any alteration of its accustomed haunts, such as the change in the appearance of a building, or by the insertion of a new door; which latter has been made the subject of a proverb in expressing a matter of astonishment—"Like a cow at a new door." Dogs are astonished at any change in the outward appearance of those they are familiar with, and at any strange object, encompassing it repeatedly, and smelling at it to discover its nature. They cannot recognise their master in the water, but swim round him, astonished at hearing his voice without identifying him. The monkey and cat beholding themselves in a mirror, are astonished at the reflection,

and seek in vain for the figure represented. A dog chasing a raven, fled with astonishment as the bird faced it, and uttered the words it had been taught.

M. Sonnini says:—"One day, as I was meditating in a garden, I stopped near a hedge. A jackall, hearing no noise, was coming through the hedge towards me; and when he had cleared himself, was just at my feet. On perceiving me, he was seized with such astonishment that he remained motionless for some seconds, without even attempting to escape, his eyes fixed steadily on me. Perplexity was painted in his countenance, with a degree of expression of which I could not have supposed him susceptible, and which denoted great delicacy of instinct. On my part, I was afraid to move, lest I should put an end to this situation, which afforded me much pleasure. At length, after he had taken a few steps, first towards one side and then the other, as if so confused as not to know which way to get off, and keeping his eyes still turned towards me, he retired: not running, but stretching himself out, or rather creeping with a slow step, setting down his feet one after another with singular precaution. He seemed so much afraid of making a noise in his flight, that he held up his large tail, almost in a horizontal line, that it might neither drag on the ground nor brush against the plants. On the other side of the hedge, I found the fragments of his meal; it had consisted of a bird of prey, great part of which he had devoured."

SYMPATHY OF SUFFERING.

This feeling, so highly characteristic of benevolence, and of kindness of heart in the human race, is most powerfully felt in the animal world. It is less surprising when extended from one to another by those of the same species, but is particularly so when exercised between those of different habits and orders. There must exist a fellow-feeling, a knowledge of the suffering felt, and a desire to alleviate it,—faculties so far exceeding the highest degrees of intelligence ordinarily ascribed to the brute creation, that it must be acknowledged that they are endowed with powers in which instinct takes no share. A wounded crow, left in a field, is soon surrounded by its fellows, seeking to assist it; a swallow entangled in its nest by a bit of thread, was immediately aided by many other swallows, which flew violently against the thread with the view of breaking it.

There is an anecdote told at the Red Lion Inn, Hungerford, of a circumstance which occurred there some years ago. A traveller, coming into the inn-yard with his chaise, ran over and bruised the leg of a Newfoundland dog, and while the injury was being examined, a raven stood by as a concerned spectator; for as soon as the dog was tied up under the manger, the raven not only visited him, but brought him bones, and attended him with particular and repeated marks of kindness. Besides the sympathy in the bird, there was also a remarkable instance of recollection and of association of ideas, for the bird had been brought up with a dog,

between whom the affection was mutual; and this dog having broken its leg, the raven attended it constantly while it was confined, waiting on it, carrying it provisions, and never scarcely leaving it. On one occasion, when the stable-door had been shut, and the raven had been deprived of the company of its friend all night, the hostler found in the morning the door so pecked away, that, had it not been opened, the raven would have made its entrance in another hour. Several other acts of kindness to dogs had been noticed, and particularly to maimed or wounded ones.

When a pig is caught in a gate, or suffers from any domestic operation, all the rest are seen to gather round it, to lend their fruitless assistance, and to sympathise with its sufferings. When the old starved elephant, which Bishop Heber saw, fell down, another elephant of very large size, and in somewhat better plight, was brought to assist. "I was much struck," says the Bishop, "with the almost human expression of surprise, alarm, and perplexity in his countenance, when he approached his fallen companion. They fastened a chain round his neck and the body of the sick beast, and urged him in all ways, by encouragement and blows, to drag him up, even thrusting spears into his flanks. He pulled stoutly for a minute, but on the first groan his companion gave, he stopped short, turned fiercely round with a loud roar, and with his trunk and fore feet began to attempt to loosen the chain from his neck." The sympathy of the animal for his suffering fellow was greater than his habitual obedience. But elephants accommodate themselves to circumstances in even a more extraordinary manner than such a refusal as this to perform a disagreeable task. The Baron de Lauriston states that he was at Lucknow when an

epidemic distemper was raging, and when the road to the palace was covered with the sick and the dying. The Nabob came out upon his elephant. His slaves, regardless of their unhappy fellow-creatures, made no attempt to clear the road; but the more charitable beast, without any command, lifted some out of the way with his trunk, and stepped so carefully among the rest, that none were hurt. Another extraordinary instance of sympathetic intelligence is recorded upon the authority of an artillery officer who witnessed the transaction:—"The battering train going to the siege of Seringapatam, had to cross the sandy bed of a river, that resembled other rivers of the East, which leave, during the summer season, but a small stream of water running through them, though their beds are mostly of considerable breadth, very heavy for draught, and abounding in quicksands. It happened that an artilleryman, who was seated on the tumbril of one of the guns, by some accident fell off, in such a situation that in a minute or two the hind wheel must have gone over him. The elephant, which was stationed behind the gun, perceiving the predicament in which the man was, instantly, without any warning from its keepers, lifted up the wheel with its trunk, and kept it suspended till the carriage had passed clear of him."

Captain Hugh Crow, in the "Narrative of his Life," relates an interesting tale of the conduct of some monkeys on board his ship. He says:—"We had several monkeys on board; they were of different species and sizes; and amongst them was a beautiful little creature, the body of which was about ten inches or a foot in length, and about the circumference of a common drinking glass. This interesting little animal, which, when I received it from the Governor of the Island of St.

Thomas, diverted me by its innocent gambols, became afflicted by the malady which unfortunately prevailed in the ship. It had always been a favourite with the other monkeys, who seemed to regard it as the last-born, and the pet of the family; and they granted it many indulgences which they seldom conceded to one another. It was very tractable and gentle in its temper, and never took advantage of the partiality shown to it. From the moment it was taken ill, their attention and care of it were redoubled; and it was truly affecting and interesting to see with what anxiety and tenderness they tended and nursed the little creature. A struggle frequently ensued among them for priority in those offices of affection; and some would steal one thing, and some another, which they would carry to it untasted, however tempting it might be to their own palates. Then they would take it up gently in their fore-paws, hug it to their breasts, and cry over it, as a fond mother would over her suffering child. The little creature seemed sensible of their assiduities, but it was wofully overpowered by sickness. It would sometimes come to me, and look me pitifully in the face, and moan and cry like an infant, as if it besought me to give it relief, and we did everything we could think of to restore it to health; but in spite of the united attentions of its kindred tribes and ourselves, the interesting little creature did not survive long."

Tavernier informs us, that as he was himself traveling in the East Indies, in company with the English President, several large apes were observed upon the trees around them. The President was so much amused that he ordered his carrige to be stopped, and desired Tavernier to shoot one of them. The attendants, who were principally natives, and well acquainted with the

habits of the animals, begged him to desist, lest those that escaped might do them some injury in revenge for the death of a companion. Being, however, still requested, he killed a female, which fell among the branches, letting her little ones, that clung to her neck, fall to the ground. In an instant all the remaining apes, to the number of sixty or upwards, descended in fury, and, as many as could, leaped upon the President's coach, where they would soon have strangled him, had not the blinds been immediately closed, and the number of attendants so great as, though not without difficulty, to drive them off. They, however, continued to run after the servants for at least three miles from the place where their companion was slain.

Dr. Percival, in his "Dissertations," speaks of the sympathy and sagacity of some rooks:—"A large colony of rooks had subsisted many years in a grove, on the banks of the Irwell, near Manchester. One serene evening I placed myself within the view of it, and marked with attention the various labours, pastimes, and evolutions of this crowded society. The idle members amused themselves with chasing each other through endless mazes; and, in their flight, they made the air sound with an infinitude of discordant noises. In the midst of these playful exertions, it unfortunately happened that one rook, by a sudden turn, struck his beak against the wing of another. The sufferer instantly fell into the river. A general cry of distress ensued. The birds hovered with every expression of anxiety, over their distressed companion. Animated by their sympathy, and, perhaps, by the language of counsel known to themselves, he sprang into the air, and, by one strong effort, reached the point of a rock, which projected into the water. The joy became loud

and universal; but, alas! it was soon changed into notes of lamentation; for the poor wounded bird, in attempting to fly towards its nest, dropped into the river, and was drowned, amidst the moans of its whole fraternity."

FELLOWSHIP OF JOY, COMPASSION.

These two feelings exist only in the higher order of animals; and with them, as with man, the former as the higher virtue, is more rare than the latter. Fellowship of joy is entirely of a selfish character, arising from circumstances in which we ourselves are intimately connected, and of this many animals are equally susceptible, but it is principally associated with feelings of gluttony and sportive pleasures, and is only recognisable as a superior potentiality when combined with affection towards the offspring. Thus animals chase each other in sport, play with and excite each other to gambol, as we see in horses, dogs, and in birds living in communities. But still this fellowship is in fact a human virtue, which in its higher attributes is not often to be met with, and hence must not be considered as proper to the animal race.

Compassion is of more ordinary occurrence. It is only necessary to particularise a few instances, for as all fellow feeling awakens the impulse to assist in, and to administer to, the wants of others, we should have to revert to sympathy for its origin. It is compassion then that induces one animal to adopt the young of another, not for its own relief, when its own have been destroyed, as not unfrequently happens, but

when it has its own to nourish and protect. And further still, caged birds have been known to feed the helpless nestlings of others introduced to them.

A wounded monkey has been seen to be dragged away by its companions, and elephants caught in pit-falls have been liberated by others. If a chamois doe be killed with a young one at its side, it is affirmed by the Tyrolese hunters that others of the flock adopt it. Terns hover round, and are loth to quit one that has been shot, and Inglis relates that if a pair of old swallows be shot, the young are attended to and reared by others. Some traces of compassion are also to be met with in the insect tribes, particularly among those which live in societies. Latreille amputated the antennæ of an ant, and others came immediately and caressed it. Cattle finding another in a ditch have been seen to express their anxiety in the most marked manner, and it is recorded that by their actions and bellowings they have induced people to come with assistance.

A lady at Chelsea, among other birds which she kept, had a canary, which was a particular favourite, but the loudness of its note often obliged her to put it outside of the window, among some trees which were trained up in front of the house. One morning during breakfast, when the cage was thus placed, a sparrow was observed to fly round and round it, to stand upon the top, and to twitter to the bird within, between whom and itself a species of reciprocal conversation at length began to ensue. After a few moments he flew away, but returned in a short time, bearing a small worm in its bill, which he dropped into the cage, and again flew away. Similar presents were received day after day, at the same time, by the canary from its kind friend the

sparrow, with whom at length it became so intimate, that it very often received the food, thus brought, into its own bill from that of the sparrow. Some of the neighbours, to try the effect of the sparrow's benevolence, also hung their birds out of their windows, when, singular to relate, they were also fed; but the first and longest visits were always paid by the sparrow to his earliest acquaintance. These attentions were continued daily for several months.

ENVY AND CRUELTY.

Birds have some little leaven of envy in their composition. Vultures drive each other clamorously away from their carrion; when the wood-pecker sees another hammering at a tree, it flies at it and attempts to dislodge it, in order to secure the insect within; the petrels quarrel for their food so furiously and in such numbers, that they often allow themselves to be caught in the blindness of their rage; horses attempt either to drive each other away from the crib, or try to monopolise their neighbour's measure; and dogs abstain from that which is entrusted to them only so long as they are unmolested, for as soon as they find themselves unable to defend their charge from other dogs, they fall to at it themselves. They are also envious of attentions and caresses bestowed on other dogs by their master. A dog was trained by his master to execute several commissions. When he wanted him to go to the tavern, he made certain signs, which the dog understood, and immediately set off to bring home whatever the tavern-keeper put into the basket intended for his

master. He went on in this manner for some time without accident; when one evening, as he was returning with some hot pies for his master's supper, two dogs in the neighbourhood, attracted by the inviting smell of the pastry, took it into their heads to attack the faithful messenger. The dog instantly dropped the basket, and placing himself before it, flew with determined courage at the first that advanced; but while he was thus engaged in fighting with one, the other dog ran to the basket and began to devour the pies. This was an embarrassing case for the poor animal. After a moment's reflection, seeing that it was impossible to preserve the pies for his master, he determined at least to have them for himself; and, accordingly, without any further hesitation, he darted upon them and dispatched all that remained.

As regards cruelty, the only real example of it is found in cats and in animals of the weasel tribe, which cripple their prey to prevent its escape, and play with it in a living state for a considerable time.

If we consider the instances of attachment, of cunning, fidelity, sagacity, gratitude, &c., ascribed to many of the lower animals, as well as the difference between old and young, in point of experience and usefulness, we cannot refer them to instinct; for we find them so numerous and well authenticated, and each individual action so diversified and adapted to times and circumstances, that if man is beholden to reason for his power of adaptation, we must also admit that the brutes are likewise possessed of a degree of rationality. As far as we are enabled to judge of the uniformity of instinct, and of the power of the natural senses, these instances of sagacity belong neither to one nor the other; consequently, they must belong to reason, or to that inter-

mediate power, which compares and combines, adapting means to ends, and varying these means according to emergencies; for, supposing the highest order of brutes are conscious of their acts, they can be classed with no other operations of the mind, with which we are acquainted.

Yet it would appear, that all the acts of apparent reasoning in the lower animals have reference to some immediate object of perception, or depend on the faculty of memory, as they seem to be nearly incapable of forming any abstract notions or speculations apart from sensible objects; and the want of articulate language must ever oppose an insurmountable barrier to their progress in acquired knowledge, beyond the merest individual experience. Of simple acts of comparison between a few ideas, we have numberless examples in the brute creation, as well as of their using means to attain their ends.

It is obvious that instinct acts more immediately and determinately on the lower animals, like the appetites in man, for the preservation of the individual and the multiplication of the species. The lower animals have also their appetites; but these are wisely placed under the government of instinct, while the appetites of man require the control of his higher principles. It is interesting, therefore, to trace the phenomena of the passions and perceptions of the animal world, of which it has been said by the wisest men, that the barrier between instinct and reason is too nice to be apprehended, and as Pope expresses it, "that these principles are for ever separate, yet for ever near."

DESIRE, APPETITE.

All desire is directed to the change of some present object, and to the accomplishment of a future; it is an act of the mind, which developes itself by excitation and stands forth in form and substance. This excitation is, hence, an active principle, proceeding from the struggle for attainment.

The aim thus sought rouses the animal from its ordinary state of tranquillity, and forms an immediate gratification in the new-born activity. But all active excitement exhausts itself, and going through a gradual course of diminution, subsides again into a state of repose. This rhythm of action and rest varies in its gradations, and appears, according to the original tendency of the animal, more prominently in one than in another; but the law in general holds good, that the more intense the excitement, the more complete the subsequent repose.

That state of rest in which all action ceases, and the intercourse with the material world is suspended, is called sleep, which reduces all the energies of the mind to a state of unconsciousness, and restores the exhausted powers of the body. During sleep, the body and its faculties are like the chrysalis in a neutral state, preparing for further development and powers.

One of the main causes which brings activity into operation, and limits itself to that object, appears to be the desire to shake off the impediments which have restrained the power of the muscles. This anxiety for action is manifest in the lowest orders of animals, and

reaches its highest degree in insects and birds. And, on the contrary, there are many animals which pass their lives inertly, as many of the crustaceæ, most of the molluscæ, and many of the reptiles, like the tortoise, chamelion, &c.

Among many of the classes and families, where the locomotive tendency is the strongest, exceptions are to be found, as in the cicadæ among insects, which to a casual observer have not even the appearance of life; among fish, the sole and the fishing frog (*Lophius piscatorius*), which latter remains so stationary at the bottom of the sea that weeds even fix themselves on its body; among birds, the marsh and waterfowl, as the pelican, which sleeps away the time that is not occupied in fishing for its prey; among the mammalia, the badger, which passes the greatest portion of its life supinely in its burrow; the sloths also are remarkably listless and inactive, remaining stationary in a tree till they have stripped it of its foliage, and then, as reported, even allowing themselves to fall from the branches rather than incur the trouble of a gradual descent.

The nature of all desire is grounded on a yearning to satisfy a want, for the mind, feeling some longing or desire, must have the cause within itself; for if this were not so, and it was impelled by some extraneous or foreign motive, it would become a mechanical action. The mind possesses within itself powers of perception, sensation and figuration, which it receives from the impressions of the outward world, and these perceptions and sensations, which operate on the desires of animals, are the only immediate ground of exertion, while the action itself depends entirely on the force of the impulse.

All exertion is thus directed to the satisfaction of some want; but the knowledge of the relations between

that want and its satisfaction may not exist, and then the mind feels a new desire, which it had not before known. The desire, which exists independent of all experience, not only of that which leads to the selection of the means to be employed, but of the absorbing feeling which seeks the consummation of its purpose, is impulse or instinct.

Desire is thus a knowledge of a thing wanted, but impulse is a desire without the knowledge or ideality of its want. Categorically speaking, all desire is founded on instinct, for no idea can be formed of the relation between the thing desired and its first accomplishment, until it has been once satisfied. It follows then, that the idea of the desire may be realised, by bringing vividly before the mind the recollection of the satisfaction of a former desire; and hence, desire by frequent fulfilment, is converted into inclination. But every instinctive want does not necessarily imply desire; for an animal cannot always have a clear idea of a desire and its bearings on its attainment, or if it can be imagined, it has not the power of reproducing the idea at will. The issue of desire from instinct is therefore effected by the senses and the imagination; but where the powers of perception, the mind and reason, are in the lowest scale of development, impulse never ascends to the level of desire, and every action is instinctive.

Hence it follows, further, that no very defined limit can be drawn between impulse and desire; for perspicuity has many degrees of variation, and impulse glides often gradually and imperceptibly into desire. On the other hand, it appears that instinct and desire stand in reversed relationship in one and the same animal, and that where one quality of desire is in the ascendant, the other sinks into the background; and

that with the progression of ideas, the capacity of the reason, and the acquisition of mental powers, and in short with a clear intellectual consciousness, instinct becomes more and more powerless, until it is almost totally extinguished.

IMPULSE, INSTINCT.

Impulse is the active principle of the mind, which is energetically devoted to the attainment of some necessary want, or the gratification of some sensual enjoyment.

As impulse produces a change in the mental temperament, by the satisfaction of some bodily want, and thus harmonises the whole system, and influences life itself, so is it also materially directed to the preservation of life.

The preservation of the creature is a chief ingredient in the harmony of the creation; wherever life presents itself it is engaged in the defence of its existence against the powers of the outward world, and in struggling against those agencies which are prejudicial to all organic bodies. All beings pass through a predestined course of progressive development, and when they have reached the zenith of their powers, they take a downward tendency, imperceptible at first, but terminating in decay and death. Before they however disappear from the active scenes of life, before they yield to the hostile powers of the immaterial world, which must unerringly consign their mortal parts to be reabsorbed by the elements, they exert themselves to perpetuate their race; their descendants then occupy their place,

and thus by the wonderful scheme of reproduction, the stream of life flows on with inexhaustible strength, and the law of existence receives a fresh impetus, instead of being cancelled by death.

Natural impulse is divided into two roots, which are all powerfully directed to provide for the two great principles of being—*self-preservation* and *propagation.* Inasmuch as the preservation of an individual, or self-preservation, depends as well on the safety from all outward injuries, as on the possession of those means and requirements which are indispensable to life, and among which subsistence is the most paramount, it has been separated into two heads, which however are concurrent with one another, and even blend in some particulars; and these are the impulses of self-preservation and of subsistence. The former, aiming at the gratification of some sensual desire, and at the accomplishment of some individual benefit, is egotistical in its very essence and materially selfish; sexual impulse, in satisfying a desire, seeks only sensual gratification, but still a wise decree, by which Nature attains her end in the propagation of the species.

Another species of impulse has still been distinguished; the furtherance, namely, of any individual object by the influence of another, and this undefined and unconscious motive is termed the sympathetic influence or attraction. In the precise ratio that the impulse of preservation is exclusively subjective, the expression of the sympathetic impulse is more or less objective, as it tends to affect the well-being of other individuals, either directly or indirectly.

This impulse manifests itself in affection and care of the young, and in social fellowship. The former is divested of all selfishness, and requires no stimulus to

be obeyed, and the gentle feelings of mankind love to dwell upon its emotions, and the parent's heart throbs under its influence.

Every impulse has a positive tendency; the *desire*, in its attraction to natural conformities, and a negative one, *disgust*, in its repulsion of what is abhorrent. In the various descriptions of impulse, different characteristics, like so many distinguishing features, are to be perceived; the principal are those of liberty, migration, building, defence, concealment, and destruction; and these are all connected with the two before named. Thus, the object of migration is to secure self-preservation, subsistence, or propagation; building seeks to provide for protection of self or of the offspring; concealment aims at the provision of food, and the secrecy of the nest or other shelter; combativeness arouses itself in self-defence, in seeking food, in the passions of the males at the pairing or rutting season, and in the protection of the young, &c.

Impulse becomes an active principle, by the urgent craving of some oppressive or all engrossing feeling to be satisfied. But this feeling is not altogether such as has been described by some philosophers and writers on natural history, as Christlob, Mylius, Krüger, Darwin, and others,—one, namely of pain, of morbid irritation, or of excessive tension of the organs, which are connected with the exercise or suppression of impulse, whereby the necessary physical results, produced by the peculiar temperament and implanted bodily organisation of the animal, determine the mode of action and its effects. It has been supposed that spiders and many caterpillars spin their threads, in order to rid themselves of an oppressive excess of materials; that birds lay their eggs, to relieve themselves of an irksome burthen, and

that they brood them, in order to transfer to them the superabundant heat of their own bodies. But caterpillars do not spin for such a purpose, for if their work be injured during its process, they repair it again and again, till they perish from exhaustion; which is subversive of the above supposition, for the local pressure must have already subsided when the cocoon was completed. And thus also with spiders, which either repair the damaged web, or construct a new one under similar circumstances. It is also well known that eggs soon attain a very high temperature, and therefore cannot possibly assist in reducing the fevered temperament of birds; and it is equally as absurd to ascribe the building of a nest, and the laying of eggs, to the necessity of seeking bodily relief,—for why should they otherwise so continually replace the number of the eggs removed, as is the case with all birds, and is familiarly proved by the domestic hen? It is impossible for any reasonable person to assert, that the abstraction of eggs can renew an organic sensation, and therefore the change in the temperament of animals can only be brought about by other means, which are arbitrarily fixed, and become the laws of instinct, which are obeyed by whole tribes of animals, to whom no other possible motive can be ascribed. Thus in the communities of bees, wasps, ants, and termites, we see the neutrals busily occupied in attending to the care of the coming progeny, and the males of birds dividing with the female the labour of preparing a nest and of brooding over the eggs and young. It is as impossible to determine or qualify the nature of idiosyncracy as it is to explain the impulse by which a new-born creature seeks its nourishment.

The operations of impulse depend on the bodily powers, with which instinct is in no ways connected, as

has been attempted to be proved by some. Organisation is the mere material or instrument employed by instinct; the vehicle, in short, of executing the awakened desire, and of realising its intended object.

Plastic life, and plastic impulse, which both belong to the vegetative sphere of existence, and which they who degrade animals to the rank of mere machines confound with instinct as the only support of their hypothesis, are subservient to instinct. Instinct is as little amenable to the material substance as the soul itself, but they do not correspond with each other in all particulars. The wild dog digs holes, and the hyæna disinters the dead, and yet neither, like the mole, are peculiarly adapted to the task in their bodily construction; the Hamster rat collects provisions by stowing them in its pouches, and the field-mouse, without such appendages, is equally provident; the rabbit burrows, but the hare does not, and yet their bodily formation is the same; and there is no superiority in the organisation of those birds which build the most ingenious nests, over those which construct the most simple, and yet their instinct is so different. As it is not to be accounted for by the variety, there remains only one principle to which it can be referred,—the mind, namely, —which has long been considered as a mere passive machine, impelled by a more powerful agent. In opposition to that argument, it is sufficient to state that impulse displays itself even before the organs on which its actions hinge, are developed. Thus calves, kids, and lambs butt with their foreheads before their horns appear; and young boars, whose tusks have not grown, perform the action of rending, instead of biting with their teeth.

All instinct is innate, independent of experience, and abundantly bestowed on the young of every animal in

proportion to its wants, and according to its species; for the majority of animals are left to act for themselves immediately after their birth, and, like the new-born infant, seek the breast of their mother, and like bees, which are no sooner released from their cells as perfect insects, than they fly abroad to collect wax to build their comb, and honey with which to store it. It is not experience which impels man and beast to assuage the cravings of hunger and thirst by food and drink; and none have ever attempted to allay the former by running, or the latter by sleeping.

Galen proved the innateness of instinct by a remarkable experiment. He took a young kid the instant it was born, and before it saw its mother, and carrying it into a room, placed before it wine, oil, honey, milk, corn, and fruit. The little animal at first got upon its legs, and shook and stretched itself; and presently, after smelling at the various articles, drank heartily of the milk. After some two months, different plants and leaves were given to it, which it equally smelled, and refusing altogether some, it ate of the others, and concluded by chewing the cud. A chicken which Wall had hatched by artificial heat, saw a spider, and springing at it, seized it as if from previous practice. Other chickens hatched by the same method, scratched the earth in search of food, in the same manner as those hatched and accompanied by a hen.

The eggs of Asiatic and African singing-birds have been hatched by the European goldfinch, and the young have preserved the song of their race, and, subsequently, adopted their mode of building. Young ducks, reared under a hen, take to the water as soon as they are hatched, obviously without any experience or prompting, to seek the proper food which that element alone

produces. Cuvier saw a young beaver, which had been brought up by a woman, carry some sticks, from which it had eaten the bark, into a corner, and pile them together; and on earth being given to it, it kneaded it together over the sticks in a compact form, and drove other sticks in at the top.

The dealings of instinct are extremely complicated; and if we watch the proceedings of only one insect, we cannot fail of being astonished at the series of combinations brought into play, as in the case of the spider, to procure its subsistence. All spiders are furnished at the extremity of the belly with four or six leaf-like protuberances, or spinners, each of which is furnished with a multitude of tubes, so numerous and exquisitely fine that, according to Reaumur, a space not bigger than the pointed end of a pin is furnished with a thousand of them. Hence from each spinner proceeds a compound thread, and at the distance of about one-tenth of an inch from the point of the spinners these threads again unite, and form the thread which we see, and which the spider makes use of in forming its web. Thus, a spider's thread, even when so fine as almost to elude our senses, is not a single line, but a rope composed of at least four thousand strands. Of such tenuity, although placed beyond all doubt by Leeuwenhoek's microscopical observations, that our imagination is too faint to form even a conception of it: our faculties are too overwhelmed by a consciousness of the imperfection of our senses when used for the purpose of scrutinising the works of nature.

The web of the garden-spider,—the most ingenious and perfect contrivance that can be imagined,*—is usually fixed in a perpendicular or somewhat oblique

* Kirby.

direction in an opening between the leaves of some shrub or plant; and, as it is obvious that round its whole extent lines will be required to which those ends of the radii that are farthest from the centre can be attached, the construction of those exterior lines is the spider's first operations. It seems careless about the shape of the area they are to enclose, well aware that it can as readily inscribe a circle in a triangle as in a square; and in this respect it is guided by the distance or proximity of the points to which it can attach them. It spares no pains, however, to strengthen and keep them in a proper degree of tension. With the former view it composes each line of five or six or even of more threads glued together; and with the latter it fixes to them, from different points, a numerous and intricate apparatus of smaller threads, and having thus completed the foundation of its snare, it proceeds to fill up the outline. Attaching a thread to one of the main lines, it walks along it, guiding it with one of its hind feet, that it may not touch in any part and be prematurely glued, and crosses over to the opposite side, where, by applying its spinners, it firmly fixes it. To the middle of this diagonal thread, which is to form the centre of its net, it fixes a second, which in like manner it conveys and fastens to another part of the lines including the area. The work now proceeds rapidly. During the preliminary operations it sometimes rests, as though its plan required meditation; but no sooner are the marginal lines of the net firmly stretched, and two or three radii spun from its centre, than it continues its labour so quickly and unremittingly that the eye can scarcely follow its progress. The radii, to the number of about twenty, giving the net the appearance of a wheel, are speedily finished. It then proceeds to the centre,

quickly turns itself round, and pulls each thread with its feet to ascertain its strength, breaking any one that seems defective, and replacing it by another. Next it glues, immediately round the centre, five or six small concentric circles, distant about half a line from each other, and then four or five larger ones, each separated by the space of half an inch or more. These last serve as a sort of temporary scaffolding to walk over, and to keep the radii properly stretched while it glues to them the concentric circles that are to remain, which it now proceeds to construct. Placing itself at the circumference, and fastening its thread to the end of one of the radii, it walks up that one, towards the centre, to such a distance as to draw the thread from its body of a sufficient length to meet the next. Then stepping across, and conducting the thread with one of its hind feet, it glues it with its spinners to the point in the adjoining radius to which it is to be fixed. This process it repeats until it has filled up nearly the whole space from the circumference to the centre with concentric circles, distant from each other about two lines. It always, however, leaves a vacant interval around the smallest first spun circles that are nearest to the centre, and bites away the small cotton-like tuft that united all the radii, which, being now held together by the circular threads, have thus probably their elasticity increased; and in the circular opening resulting from this procedure, it takes its station and watches for its prey, or occasionally retires to a little apartment formed under some leaf, which it also uses as a slaughter-house. The moment an ill-starred fly, or other insect, comes in contact with the net, the spider springs upon it with the rapidity of lightning; and if the captured insect be of small size only, the spider conveys it at once to the

place of slaughter, and having at its leisure sucked all its juice, throws out the carcase. If the insect, being somewhat larger in size, should struggle to escape, the spider, with surprising address and agility, envelopes its prey in a mesh of thread passed round its body in various directions. Both its wings and legs being by these means effectually secured, it is then conveyed to the den, and devoured. Sometimes a bee, or large fly, too powerful to be mastered by the spider, happens to get entangled in its toils. In this case, the wary animal, conscious of its incapacity to contend against such fearful odds, makes no attempt either to seize or embarrass the intruder; on the contrary, it assists the entangled captive in its efforts to free itself, and often goes so far as to break off that part of the web from which it may be suspended; apparently content to get rid of so unwelcome a customer at any sacrifice.

The operations of instinct are even more confirmed when carried out by many individuals, or even by a whole community of the same species; demonstrating clearly that the bond which unites so many distinct intelligences or instincts, cannot be of a material nature.

Instinct is not capable of improvement, but assumes at once the highest range which is competent to it; for perfection is only to be attained by experience, and to that the faculty of thought is essential: a desire, founded on the clear perception of the object desired, ceases to be instinct.

Intellect must not be confounded with instinct; for as the former decides by reflection and judgment, the latter acts only from natural impulses; which, however remarkable in their combinations, and in their resemblance to human agencies, are nevertheless of an

entirely distinct character, although they shadow out higher purposes and powers in animals than they actually possess, and a greater knowledge and experience than the most perfect of them can ever attain to.

Instinct is an inheritance peculiar to each species, from which it is inseparable; intelligence is the property of an individual; by means of the former, the animal is dependent on nature, and by the latter it emancipates itself, and arranges its plans according to its discernment. Instinct never varies in its mode and character; bees toil still, as they did when Aristotle studied them, and when Virgil described them; the evidence of intelligence varies, for if sometimes it has for several successive generations hardly risen to the level of instinct, it shines suddenly forth in one individual, affording thereby the distinct proof, that animals also are gifted with no ordinary powers.

Difficulties and impediments produce a change in the workings of instinct, which appears to be brought about by a clear consciousness of their existence. Some bees were placed in a glass hive, so flat that they could not construct their cells of the necessary depth; but the queen deposited her eggs in them, and the working bees fed the grubs, and in due time closed the apertures to the cells; but after some days, as the grubs grew, the coverings of the cells burst and the future insects lay exposed; to remedy this, the bees reclosed the cells with a convex covering, and thus gave them a sufficient depth. Huber, in his *Nouvelles Observations sur les Abeilles*, and Kirby, recite similar cases, where the ordinary course of operation was departed from.

To this place belongs what may be called the accommodation of instinct, which consists of the employment of other than the usual means to attain an end. The

bird thus often constructs its nest of materials not usual to its species; and Rennier, in speaking of the white-eyed fly-catcher of America, says, that in the construction of its nest it employs the lightest materials, such as fibres, grass, &c., but that he saw one formed, to a great extent, of little slips of paper. And in another place he says, that the wren builds its nest of green moss, most artificially contrived to blend with the colour of the adjoining foliage, and lined inside with the softest feathers; but that he once found one composed entirely of straw, and filled within with dogs' hair, and the shafts of quills collected from the dust heap of a neighbouring school. Knight observed, that a bird which had its nest in a forcing-house, never sat during the day, as the heat of the house was sufficient for its purpose, but at night when the temperature fell, it took its place on the eggs. The same trait has been ascribed to the ostrich, which as asserted by some, leaves its eggs to the influence of the sun during the day.

One of the tribe of caterpillars which feed on decayed wood, and which form a cocoon from particles of the same materials, rasped off the surface of a box in which it was confined, for the same purpose. Bees which have once invaded a neighbouring hive, cease to go abroad to collect honey from its proper source, but continue to rob from other hives. The bees which were introduced at Barbadoes, ceased, after a few years, to gather honey and to store their hives, as they gained their subsistence from the sweets of the sugar-houses. The larvæ of the Cadew flies attach to their cases a straw or a little stone, when they are either too heavy or too light.

The sparrow often usurps possession of the nest of the swallow, and the fox drives the badger from its hole to occupy it himself; which are so many convincing

proofs that the selection of materials and of localities, is not so much the result of instinct as it is of the choice of the animal itself.

Exceptions to instinctive habits, as regards their apparent subjection to one principle, occur frequently from fear, compulsion, and the want of necessary food, and appear, particularly in confinement, in new and unnatural characters. Two silk-worms, confined in a small space, may be made to spin a joint cocoon for their transformation. Hunger compels animals to feed on those substances which they would otherwise refuse, and thus they have been habituated to new food.

Animals are often driven by circumstances to change their natural habits, and to adopt one adapted to the particular circumstances of their positions; thus, a colony of hares, introduced on a sandy plain on the western shores of England, exposed to all the blasts of the Atlantic, commenced burrowing in the sand hills to obtain shelter; and rabbits, whose earths have been much disturbed by ferrets, cease to burrow, and lie in the open fields like hares.

If the tendency of instinct be impeded, and the impediment be not of long continuance, it returns again, and often with increased power on the removal of the obstruction; but it becomes extinguished if protracted too long, or so serious a derangement takes place in the economy of the animal that it perishes; which are all evident proofs that the impulse is an effort directed to the change of an actual state and the attainment of a concentrated desire. Snails, if kept lively during the winter, perish in the ensuing summer; and the cuckoo, if prevented from migrating, dies, notwithstanding the greatest attention and the supply of sufficient food and warmth.

The duration of instinctive propensities is prolonged by accidental events or derangements; thus caterpillars spin fresh cocoons, and spiders new webs, if the former be destroyed; and birds build new nests, and lay fresh eggs, if the first be taken away.

Some forms of instinct occur but once, as is the case of insect metamorphoses, where the whole powers of the creature are directed to perfecting its arrangements for its protection and preservation during the period of its transformation, such as inclosing itself in a cocoon, or burying itself in the earth; others are of frequent recurrence, and are periodical according to the hour of the day or the seasons of the year, according to certain metamorphoses, or the effect of outward influences, whether variable or accidental.

Races closely connected, and indeed individual animals of such races, vary considerably in their modes of instinct, as well as in their powers of intelligence, as many spiders, bees, dogs, and birds. The European ants hybernate, while those of the Brazils, in the season corresponding to our winter, wander at large, preying on every insect they fall in with. Others of the family inhabiting the torrid zone, close every aperture to their hills during the rainy season, but remain in full vigour, feeding on the provisions they had laid up. Among our domestic animals, the goats and sheep differ much in their habits. The instinct of the dog varies in every variety of the family, some following game by sight, and others by scent. How different again are the buffalo and the ox, and the African and the Asiatic elephant, the latter being far more docile and possessing more intelligence than the former. Our bulfinch, like other *Loxias*, builds a slovenly nest, but the bird of South Africa, shaped similarly in bill and feet, con-

structs the most skilful; and the social grosbeaks (*Loxia socia*) build an enormous one with divisions, capable of holding an immense community.

Instinctive operations, in many cases, are confined only to one sex, as in some birds, where the female only broods over the young; but still the dormant faculty in the other sex can be awakened under extraordinary circumstances. If the breast of a capon be plucked and irritated with sting-nettles, the bird will brood a nest of eggs with the patience and assiduity of a hen, from the comfort and relief which the contact of the eggs affords; but at the appointed time, when they are hatched, it leads the chicks forth, broods and attends to them with the most jealous care.

A collision of instinct sometimes occurs when one powerful and engrossing feeling, which has been kept in subjection by others, bursts forth, and, like an uncontrollable torrent, acknowledges neither curb nor limit. The feeling of self-preservation is the most powerful, but is quenched by impulses more exciting for the moment. Animals rendered desperate by hunger will attack others more powerful than themselves; and, forgetful of their habitual caution and suspicion, plunge headlong into the trap, whose tempting bait they could not resist.

Generally speaking, individual instinct, as regards self-preservation, is secondary to that which influences the propagation and defence of offspring. In males the sexual desire, and in females the care of their young, absorb every other consideration, and the powerful hand of Nature, by these agencies, provides for the due perpetuation and protection of the various races of animals. Males, at these epochs, are blind to all danger; the considerations of food and safety are lost

in the overwhelming excitement of desire; the females watch over and defend their young with the utmost obstinacy, even to the sacrifice of their own lives. The bereaved tigress follows up the robber of her young and compells restitution; and the hen partridge flies boldly in the face of the dog which disturbs her brood. The natural affection of the whale for its young is particularly interesting. The cub, being insensible to danger, is easily harpooned, when the attachment of the mother is so manifested as to bring it almost certainly within the reach of the whalers. Hence, though the cub is of little value, it is often struck as a snare for the mother. In this case she joins it at the surface whenever it has occasion to rise for respiration, encourages it to swim off, and seldom deserts it while life remains. She is then dangerous to approach, but affords frequent opportunities of attack. She loses all regard for her own safety in anxiety for the preservation of her young, dashes through the midst of her enemies, despises the danger that threatens her, and even voluntarily remains with her offspring after various attacks on herself. "In 1811," says Mr. Scoresby, "one of my harpooners struck a sucker, with the hope of leading to the capture of the mother. Presently she arose, close to the 'fast boat,' and, seizing the young one, dragged about six hundred feet of line out of the boat with remarkable force and velocity. Again she rose to the surface, darted furiously to and fro, frequently stopt short, or suddenly changed her direction, and gave every possible intimation of extreme agony. For a length of time she continued thus to act, though pursued closely by the boats; and, inspired with courage and resolution by her concern for her young, seemed regardless of the dangers which surrounded her. At

length one of the boats approached so near that a harpoon was hove at her: it hit, but did not attach itself. A second harpoon was struck, but this also failed to penetrate; but a third was more effectual, and held. Still she did not attempt to escape, but allowed other boats to approach; so that, in a few minutes, three more harpoons were fastened, and in the course of an hour afterwards she was killed." There is something extremely painful in the destruction of a whale, when thus evincing a degree of affectionate regard for its offspring which would do honour to the superior intelligence of human beings, yet the feelings of compassion must give way to the object of the adventure, the value of the prize, and the joy of the capture. The affection between the parent and young of the Polar bear is so great that they will sooner die than desert each other in distress. While the *Carcass* frigate, which went out some years ago to make discoveries, towards the North Pole, was locked in the ice, early one morning the man at the mast-head gave notice that three bears were making their way very fast over the frozen ocean, and were directing their course towards the ship. They had, no doubt, been invited by the scent of some blubber of a sea-horse that the crew had killed a few days before, which had been set on fire, and was burning on the ice at the time of their approach. They proved to be a she bear and her two cubs, but the cubs were nearly as large as the dam. They ran eagerly to the fire, and drew out of the flames part of the flesh of the sea-horse that remained unconsumed, and ate it voraciously. The crew from the ship threw great lumps of the flesh of the sea-horse, which they had still remaining, upon the ice. These the old bear fetched away singly, laid every lump before her cubs as she brought it, and,

dividing it, gave to each a share, reserving but a small portion to herself. As she was fetching away the last piece, the sailors levelled their muskets at the cubs, and shot them both dead; and in her retreat, they wounded the dam, but not mortally. The affectionate concern expressed by the poor beast in the last moments of her expiring young was most touching. Though she was herself dreadfully wounded, and could but just crawl to the place where they lay, she carried the lump of flesh she had fetched away as she had done others before, tore it in pieces, and laid it before them; but, when she saw that they refused to eat, she laid her paws first upon one, then upon the other, and endeavoured to raise them up; all this while it was pitiful to hear her moan. When she found that she could not stir them, she went off, and, when she had got to some distance, looked back and moaned; and, that not availing her to entice them away, she returned, and smelling round them, began to lick their wounds. She went off a second time as before, and, having crawled a few paces, looked again behind her, and for some time stood moaning. But still her cubs not rising to follow her, she returned to them again, and with signs of inexpressible fondness, went round them, pawing them, and moaning. Finding, at last, that they were cold and lifeless, she raised her head towards the ship, and uttered a growl of despair, which was answered by a volley of musket balls, and she fell between her cubs, and died licking their wounds.

The effects of discipline, fear, and habit, are sufficient to suppress any action of impulse, and it is by the employment of them that animals are successfully tamed. But their own impressions, conceived and entertained by animals themselves, are equal to restrain their impulses,

if they have not already reached to too high a point. And herein consists the mixed character of such actions, in which both instinct and intelligence participate; it is a combination of powers, where instinct becomes subservient to intelligence, or seeks its assistance; and thus there exist many intermediate steps between the dealings of pure instinct and discriminate choice. It is instinct which urges the canary bird to build a nest for the reception and rearing of its young; but when it happens to deposit its egg at the bottom of its cage, and refuses to forsake it, the male collects the wool and other articles provided for it, and they both together assist in constructing a nest round the egg, in which the hen deposits her other eggs, and raises them all together: in such a case the instrumentality of intelligence prompts the construction of a nest after its necessity has appeared. It is by instinct that the sporting dog pursues the hare, but it is intelligence which urges him to drive it in the direction of his master. But instinct is sometimes at fault, and its powers are uselessly applied. A hen will sit with the greatest tenacity on rounded pieces of chalk; and the Hamster rat breaks the wings of dead birds as well as of living ones before it devours them. Insects also occasionally err on the same principle, as when the blow-fly lays its eggs on the flower of the stapelia, deceived by its carrion-like odour. A spider, deprived of its egg-bag, will cherish with the same fondness a little pellet of cotton thrown to it.

When such irregular dealings of instinct occur at after-periods, they are readily to be ascribed to a mistaken resemblance of objects to those which the recollection or experience of the animal points out as having been subservient to its purposes at a former time; but

should such actions fall altogether out of the range of instinct, and be the result only of will, they would belong then to want of discernment and intelligence. And when the expression of instinct occurs originally in a manner opposed to the rules of nature, it resembles the monsters which are occasionally born at variance with the laws of propagation.

Instinct also shows itself in cases where it is utterly useless, and where its object cannot be attained. The tame squirrel in confinement hoards up the food which it will never require nor touch; well-fed dogs will hide bones; and tame ravens conceal morsels of food, although an abundance is always before them. Fowls scratch for food on the paved surface of a yard, and a tame beaver has been seen to attempt to construct a house.

Man is also endowed with instinct. The nursling seeks its mother's breast, and the child stretches forth its hands when about to fall. In adults it is equally conspicuous; for although it is but dimly shadowed forth before the reason is developed, and the mental faculties are expanded, and is always inferior to that of animals, yet it is ever active for preservation and protection against bodily injury. It is an unconscious craving, which urges us to assuage the thirst of summer and of fever with acid drinks; to seek one remedy and to refuse another. The sensations of fatigue or of excitement impel us to take either rest or exertion. It is chiefly in the organs of motion that the effects of instinct are most prominent. We shudder involuntarily at any painful contact, and attempt to avoid it, even if it be only the momentary annoyance of an insect; we close the eyelids against a too dazzling light, at the approach of any foreign object, against smoke and dust, and even against vapour and fog. The adult, like the

child, stretches forth his arms to protect himself when falling; we recover our balance by an inflection of the body; and whether precipitated from a height, or falling into the water, we clutch at the first substance that presents itself.

It is design that prompts animals to satisfy the callings of instinct, co-existent with which an impulse is created, which, though irresistible, is not abused, nor carried beyond its immediate purpose. The Lämmergeier sweeps through the sky like a living sword over the animal world; but its fierceness is raging hunger, and its beak is less guilty than the sword. Man has a higher duty; he must not only discriminate the good, but must also perform it. He is doubtless strongly under the influence of impulse; but being governed by other than mere animal passion, he can control it by his moral power. Every enjoyment obtained at the cost of his higher duties, demoralises and dishonours him.

Instinct, as an inferior faculty of the mind, so indispensable to man in his uncivilised and infant state, ceases to assist him as manhood advances, and the mental powers acquire their full development; but it ever maintains its influence over the animal world, and, by an inherent power, seems to direct creatures but newly born, when weak and helpless, without knowledge of means and ends, without instruction or experience, without practice or trial, when awakening into life without the least consciousness of external nature, to the performance of the most wonderful actions. Instinct guides them to their proper element, teaches them to avoid the ambush of enemies, and to preserve their ephemeral life from threatening and positive dangers. It prompts them to provide for their young, which in numberless instances they will never see; to build

habitations, whose arrangements and construction astonish even the most indifferent observer, to wander over mountains and seas to distant hemispheres, whose nature is strange to them, and from which many never return. The goodness of Providence thus compensates to them the want of the higher intellectual attributes, and puts them in a position to fulfil the part assigned to them in the creation, in the most perfect, the easiest, and the surest manner.

In recent times the question of the seat of instinct has been again mooted, and an opinion laid down, that it is to be found in the nervous system of the stomach. But the defenders of this theory seem altogether to have forgotten that instinct is not the result of a mere plastic arrangement, but of a mental faculty, which, though distinct from organic life, yet stands in the closest connection with it. That instinct does not depend on the nervous system of the stomach, is proved by the fact, that it differs most materially in animals whose nervous system is formed on the same type; and that a great class of animals, the molluscæ namely, possess a most complicated nervous system of that nature, and are endowed with the least possible degree of instinct in comparison.

Instinct, as far as it can be defined, appears to be an unconscious and involuntary craving, called forth by a change in the animal temperament, in the same manner as a voluntary desire is awakened by the perception and idea of the thing desired. We may search, on the one hand, for the cause of this change of temperament, and, on the other, why the craving exhibits itself in one particular manner and in no other; we may build conclusion on conclusion, and register answer upon answer, and yet leave the problem unsolved. Like

an attempt to give form and substance to the sportive fancies of a dream, and to weave them into omens and prophecies of the future, we only carry the building of our hypotheses higher, without adding one stone to the foundation of truth. We can understand as little how these spiritual predestinations are connected with bodily agencies, as we can dive into the varied dispositions of men.

Addison, in one of his papers in the "Spectator," considers instinct as the immediate direction of Providence, and such an operation of the Supreme Being, as that which determines all the portions of matter to their proper centre. He says: "I look upon instinct as upon the principle of gravitation in bodies, which is not to be explained by any known qualities inherent in the bodies themselves, nor from any laws of mechanism, but as an immediate impression from the first Mover, and the divine energy acting in the creatures." Looking at migration in this light, we cannot consider it as arising only from an exquisite sensibility in animals for atmospherical changes. Second causes are always under the direction of the first, and as migration must not be looked at as connected with this country, or with this hemisphere alone, for the southern hemisphere and its lands have equally their benefits to receive, we cannot err in declaring it to be a second cause appointed by the most excellent Wisdom. We know that when animals of any kind exceed certain limits, though beneficial in the ordinary exercise of their instincts, they become obnoxious, and that therefore man and other animals are appointed to destroy a certain number of them, that they may bear a due proportion to other beings on which they act, and in this duty migration

lends its aid.* Writers inform us that in tropical countries the year is not divided into winter and summer, but into the rainy and dry seasons: as to temperature, the former may be said to correspond with our winter, and the latter with our summer, but with respect to the state of animals and vegetables, the reverse would appear to be most consistent with facts. The great rains begin to fall in the tropics about the middle of September, when all nature seems to wake from its periodical repose; vegetation resumes a more lively tint, and the greater part of plants renew their leaves; the insects begin to reappear; in October the rains are rather more frequent, and with them the insects; but it is not till towards the middle of November, when the rainy season is definitively set in, that all the families appear suddenly to develope themselves; and this general impulse that all nature seems to receive, continues augmenting till the middle of January, when it attains its acme. The forests then present an aspect of movement and life, of which our woods in Europe can give no idea. Thus exactly at the season of the year when all nature is in a state of stern repose with us, she is teeming with life there, and when she droops there, she is in full vigour with us; and to save both in their respective seasons from injuries and torments, from an excessive superabundancy of insect life, to be feared like one of the plagues of Egypt, is the dispensation of migration, and to which animal instinct is made subservient.

* Kirby.

SELF-PRESERVATION

Is especially directed in guarding off those agencies which are injurious and prejudicial to life, and is assisted in numberless instances by peculiarities in the organisation of the creatures themselves. Many natural historians define this as a passive faculty, and range under this head a remarkable tenacity of life, the power of supporting various temperatures, hybernation, the nature of the covering in animals, their form and colour, certain involuntary discharges and separation of parts, the medium in which the animal was born, and lives, &c.

But other means, dependent on the animals themselves, are also employed, such as spinning and building on the earth and in the water; the abandonment of an ungenial medium and the adoption of another, either for a season or for the momentary protection from danger; various migrations; the voluntary discharge of juices and secretions in moments of danger; and especially certain attitudes and movements, as well as the use of natural weapons. These measures so immediately subservient to the impulse of preservation are called the active faculties, but in some cases it is extremely difficult to define the distinction between the two.

TENACITY OF LIFE.

Among the lower animals this faculty is the most remarkable in the polypi; they may be pounded in a mortar, split up, turned inside out like a glove, and divided into parts, without injury to life; fire alone is fatal to them. It is now about a hundred years since Trembley made us acquainted with these animals and first discovered their indestructibility. It has subsequently been taken up by other natural historians, who have followed up these experiments, and have even gone so far as to produce monsters by grafting. If they be turned inside out, they attempt to replace themselves, and if unsuccessfully, the outer surface assumes the properties and powers of the inner, and the reverse. If the effort be partially successful only, the part turned back disappears in twenty-four hours in that part of the body it embraces, in such a manner that the arms which projected behind are now fixed in the centre of the body; the original opening also disappears, and in the room of feelers a new mouth is formed, to which new feelers attach themselves, and this new mouth feeds immediately. The healed extremity elongates itself into a tail of which the animal has now two. If two polypi be passed into one another like tubes, and pierced through with a bristle, the inner one works its way through the other, and comes forth again in a few days; in some instances, however, they grow together, and then a double row of feelers surround the mouth. If they be mutilated, the divided parts grow together

again, and even pieces of two separate individuals will unite into one.

These hydra-like creatures are often infested with parasitical infusoria, called polypus lice, of which they try to rid themselves, by extending, contracting, and rubbing their arms.

The vital tenacity of the infusoria is by no means so great as that of the fresh-water polypi; and such as have been swallowed, and are set at liberty again, do not resume their activity if they have been too long in the stomach. The resuscitation of dried ones, which is denied by Schrank, and is without analogy in the animal kingdom, rests on Ehrenberg's researches into the amphibious life of infusoria. The *Callidina rediviva*, for instance, which is found in dry sand, lazy, torpid, and even deadlike, moves with great activity in water. In many instances this apparent resuscitation seems to be nothing more than the production of a second generation by the development of eggs, whose vitality has been preserved. In the medusæ, again, the tenacity of life is far less than in the polypi; if a piece be cut from them, the wound grows up and heals, but the piece has no power of reproduction, nor is any exception known, save in the cases of the water-centipede (*Nais*) and in the tape-worm. Intestinal worms found in the body of a cutwater (*Rhynchops*), after having been immersed for eleven days in spirits of wine, and become brittle, revived again. The resuscitative power of the holothuriæ, according to Dalyell, is so great, that they may be deprived of their feelers, mouth, proboscis, and their bodies emptied so as to resemble a sheath, and yet not die. Other worms and molluscæ possess less tenacity of life.

Crabs and lobsters reproduce lost members, and,

according to Menge, a slight injury, or the loss of a limb, does not necessarily entail death on spiders; but, on the contrary, as long as they cast their skins, the lost feelers and joints are replaced, and to a perfect extent while the animal is yet young.

Flies, found drowned in a cask of Madeira wine, revived; and crickets, thrown into water, and allowed to remain for several days, were resuscitated by Geubel, who covered them with pulverised chalk, and at the expiration of some hours, the palpi and antennæ showed signs of life, and, finally, the insects entirely recovered their power, and flew off. Resuscitation has also occurred after they have been subjected to an elastic fluid, like nitrogen gas, and then exposed to the air; and several species of the cerambyx, and many others of the coleopterous insects, recover after having been in spirits of wine for many hours.

Some insects will live a long time after the loss of some important portion of their bodies. A *Carabus granulatus* has been seen to run without a head; and a *Cerceris*, deprived of its head at the moment it was inserting itself into the cell of a bee, to deposit its eggs, continued its attempt, and turned back to it after it was placed in an opposite direction. Crickets will live for a couple of days without heads, and will linger for several hours when deprived of their entrails; and wasps will attempt to sting after their bodies are divided.

Ascending higher in the animal world, we find that reptiles, and many species of fish, can endure the most violent injuries. Eels are proverbially difficult to kill; and the shark preserves its vitality after every cruelty has been heaped upon it.

The tenacious power of life in the frog, is beyond

measure extraordinary; it is neither affected by the exhaustion of an air-pump, nor destroyed when frozen into a solid mass. The *Triton cristatus* has the power of reproducing parts and joints of which it has been deprived, and even an eye; the tail and feet have been known to replace themselves six times in the course of one summer, so that six hundred and eighty-seven new bones were reproduced. If the *Salamandra maculata* be deprived of its head, the trunk remains standing on its feet, and turns on being touched. Tortoises, from which the brain has been abstracted, wander about for months with closed eyes, feeling their way, and have survived for twenty-three days without a head. Azara caught two without heads in a river in Paraguay, but they escaped back with as much speed and address, as if they had been uninjured.

Among warm-blooded animals the tenacity of life exists in a much less degree; but whether among birds, or the mammalia, it is greater among the carnivorous varieties than the herbivorous and granivorous. Cats and foxes among the mammalia possess the greatest tenacity.

Sir Edward Parry, in the narrative of his second Polar voyage, says:—"A wolf being caught in one of the traps, which was so close as to be easily watched from the ship, a party of the officers ran out to secure the depredator, and fired two balls into the trap at once to despatch him. Finding after this that he continued to bite a sword that was thrust in, a third shot was fired at him. The trap was then sufficiently opened to get his hind legs firmly tied together, after which, being considered tolerably secure, he was pulled out of the trap, which, however, his head had scarcely cleared, when he furiously flew at Mr. Richards' throat, and

would certainly have done him some serious mischief had not that gentleman, with great presence of mind, seized the animal in his turn by the throat, squeezing him with all his force between both hands. This made the wolf relinquish his first attempt, and Mr. Richards only suffered by a bite in the arm, and another in his knee, which, on account of the thickness of his clothes, were happily not severe ones. As for the wolf, he prudently took to his heels, though two of them were still tied together, and being favoured by the momentary confusion, occasioned by his late rencontre with Mr. Richards, succeeded in escaping his pursuers. He was found dead the following day at the distance of three quarters of a mile from the ship."

TEMPERATURE.

A CONFORMABLE temperature is necessary to the existence of most animals. Although many live and enjoy themselves in the polar regions, and under ice, yet the greatest number prefer warmth, and seek to protect themselves from variable temperature, and especially from cold. Their construction is a great predisposing cause. Most of the plants in a mild climate are smooth and bare in their stems, bark, and leaves, while those of cold and boisterous countries are rough and hairy, and the same rule applies to animals: covering is indispensable to protection.

A peculiar property belongs to furred animals on the approach of inclement seasons, an increase, namely, in the fur, in proportion to the coldness of the region.

The coat of the Norwegian horses is much longer than that of the German. Its continuance depends entirely on the length of the cold season; thus, the Alpine horses preserve their winter coats from six to seven months in Switzerland, from eight to nine in Norway, in Lapland ten months, and in Greenland throughout the year. According to Eichwald, the aurochs, or wild bull, still found, though rare, in the forests of Poland, acquires its new coat only a few days before the setting in of the winter, and loses it as rapidly on the first return of thaw.

Many animals have, however, the power of bearing the greatest difference of temperature, and many infusoria live in the Alpine snow. According to Shuttleworth and Vogt, there are five organisms endowed with this property, of which four belong to the Infusoria, and one to the Crustacea, and these organisms give a red colour to the snow. A multitude of infusoria are found beneath the ice in winter, of which Schmarda enumerates fifty species as found by himself. Doyère dried wheel animalculæ, and having damped them, and put them for a few minutes into a temperature of from 120 to 140° of Reaumur, several recovered, but the experiment establishes no proofs, as it is entirely isolated, and without analogy.

Insects are to be found in the greatest extremes. Reaumur and Degeer found the larvæ of gnats in ice. Captain Buchan saw a frozen lake which in the evening was all still and hard, but as soon as the sun had dissolved the surface in the morning, it was in a state of animation, owing, as appeared on close inspection, to myriads of flies let loose, while many still remained fixed and frozen round. Ellis also mentions that a large black mass like coal or peat, dissolved, when

thrown upon the fire, into a cloud of mosquitoes. Humboldt found beetles far above the line of perpetual snow of the Cordilleras. Several springtails (*Podura hiemalis* and *glacialis*) live on the snow, and impart to it a black or red colour. On the other hand, Dr. Reeve found larvæ, supposed to be those of the Crane fly (*tipula*), in a hot spring, at 205° of Fahrenheit, and Perty discovered caddis larvæ (*phryganea*) in a spring in Wales, at 150° of temperature.

Among fish, the bream, if packed in snow, can be preserved alive for a considerable time, and carp, after having been frozen so hard as to require the force of an axe to divide them, have recovered on being thawed. Frogs and toads can endure a surprising degree of cold. Gaimard made repeated experiments on the latter in Iceland in the winter of 1828—29, and found that they could be frozen so hard that the spaces between the muscles were filled with ice, that all functions ceased, and that they could be broken in pieces without exertion, and yet on being exposed to a warm temperature, they recovered their vitality in the space of ten minutes, and were perfectly lively. Many animals withdraw themselves, to avoid any unpleasant degree of temperature. Aristotle was aware that the sea anemone will not expand itself during the heat and glare of the sun. This withdrawal is peculiar to animals which do not hybernate, and indeed it is common to them to conceal themselves in cold weather, other than that of winter; and it is particularly the case on the approach of that season, when they also begin to associate, as we see in birds, deer, and wolves. Some scrape holes, and others, which have fixed habitations like the marmot, protect themselves from the cold by heaping up earth and stones at the entrances; the squirrel stops up the mouth

of its nest in stormy weather; the hamster burrows as deep again in winter as in summer; and the willow-grouse buries itself in the snow for warmth.

Many animals again leave their accustomed haunts as the cold sets in. The Chamois and Ibex, which frequent the highest mountains, particularly those with a northern aspect, during the summer months, betake themselves in winter to the southern sides and the valleys; the stag, the roe, and the rein-deer, leave also the elevated land for sheltered plains and coverts, and in extreme cold even approach human habitations. Birds, too, under similar circumstances, seek the same shelter, and seem to claim the protection of man. Göze relates, that a redbreast, which had made a shelter of his house through one winter, returned again for several years at the same season.

> "The redbreast, sacred to the household Gods,
> Wistful regardful of th' embroiling sky,
> In joyless fields, and thorny thickets, leaves
> His shivering mates, and pays to trusted Man
> His annual visit. Half afraid, he first
> Against the window beats; then brisk, alights
> On the warm hearth; then, hopping o'er the floor,
> Eyes all the smiling family askance,
> And pecks, and starts, and wonders where he is;
> Till, more familiar grown, the table crumbs
> Attract his tender feet."

The northern birds wing their way to the south, and many mammalia shift their quarters; the seal leaves Greenland and Spitzbergen for the shores of Iceland; the Bison, the American black bear, and the Kulan, or wild ass of Tartary, wander northwards in summer and southwards in winter.

Some animals avail themselves of the means offered them by man to protect themselves, and others seek his presence for the purpose. Snakes in the East, are

often found coiled up under the coverings of beds, and even on the bodies of people asleep; and cats, which can bear vicissitudes of temperature, prefer warmth, and nestle willingly in beds. Monkeys will fetch of themselves the blanket appropriated to them, and dogs scrape and arrange their straw, so as to secure the greatest warmth.

HYBERNATION.

HYBERNATION is the means by which animals are enabled to avoid the susceptibilities to which they are subject, from the variations of temperature: the action of life ceases in the outward parts, and maintains so faint a hold in the inward, that it is altogether suspended, and in the vegetable world it sinks even to a lower degree. Animals in this state, and rolled up so as to retain as much as possible of their own warmth, are enabled to endure the extremities of cold. Snails hybernate in holes and crevices with a southern aspect, the opening of the shell being closed up with a strong chalk-like covering or operculum; and worms become torpid, after having penetrated to a depth of three or four feet in the earth, at the close of the autumn; but, as soon as the earth is released by the thaw, and is softened by the softness and warmth of spring, they appear on the surface in vast numbers.

Most of the true spiders pass the winter in a benumbed state in holes and in the crevices of trees; and the hunter spider (*Aranea scenica*) spins itself a little bag, which it closes at both ends in some secure shelter. Most insects hybernate, leaving their accustomed haunts towards the close of autumn, and seek

well-sheltered spots, under stones and moss, under the bark, and in the decayed wood of trees, in the depth of the earth, and, like the water beetles, in the slime of marshes. Many, which live in communities, hybernate also together, as if thereby to increase the temperature. Schmid, a German naturalist, maintains that such insects only survive the winter, as continue for a short time in the larva state, and that all such as remain for a year or more in that form, do not survive.

Fish withdraw chiefly into the depths at the approach of winter, and many bury themselves in the mud, rising occasionally to the surface, and to holes in the ice in frozen streams, to breathe.

Lizards hybernate in cavities and holes in the earth, and frogs conceal themselves in the mud; and snakes and tortoises make subterranean retreats, the latter, particularly, digging for themselves holes, and covering themselves by a laborious process. Opposed to the habits of the European frog in the winter, are those of the tropical animal, which buries itself in the mud to escape the burning heat of summer; and, indeed,* it is most remarkable in the economy of nature, that an approach to the maximum of heat produces to some extent the same effects upon organised nature that an approach to the minimum does. In tropical countries, to which previous allusion has been made, where rainy and dry seasons mark the vicissitudes of the year, the withdrawal of food, consequent on the parching drought of the latter period, when nature lies scorched beneath the rays of the vertical sun, causes a suspension to the activity of insect life, as great as that produced by the chilling winters of the north. It is analogous to hybernation, for nature during that

* Kirby.

period is preparing equally to renew its vigour, and, in obedience to the Divine mandate, "to replenish the earth." It is the season of rest, from which the insect world emerges in countless and increased multitudes, and fills the air with gladness.* During part of the day a vast and uninterrupted hum is heard, in which the deafening cry of the tree-hopper (*Tettigonia*) prevails; and it is impossible to take a step, or touch a leaf, without putting insects to flight. At 11 A.M. the heat is insupportable, and all animated nature becomes torpid; the noise diminishes; the insects and other animals disappear, and are seen no more till the evening. Then, when the atmosphere is again cool, to the morning species succeed others whose office it is to embellish the nights of the torrid zone, namely, the glow-worms and fire-flies (*Elater noctilucus*). Whilst the former, issuing by myriads from their retreats, overspread the plants and shrubs, the latter, crossing each other in all directions, weave in the air, as it were, a luminous web, the light of which they diminish or augment at pleasure. This brilliant illumination only ceases when the night gives place to the day.

Of all the varieties of instinct, hybernation is one of the most wonderful; and, as Dr. Virey says on the subject, "is it anything else, but the manifestation without of that same wisdom which directs, in the interior of our body, all our vital functions!"

* Kirby.

THE FORM AND COLOUR OF ANIMALS.

Both are the effect of plastic life, and independent of the animals themselves; and, as in abundant instances they assimilate with those of surrounding objects, animals are thereby enabled to escape the search of their enemies. This is particularly the case with insects, many of which repose on those substances which bear the greatest resemblance in colour to their own bodies. Thus, many of the genus Harpalus prefer loamy ground, and moths settle by day on the stems of trees, from whose grey and mottled bark they are not easily to be distinguished. The green grasshopper is with difficulty seen on the grass, and the brown ones and crickets harmonise in colour with the parched plants of the heath. The insects composing the Mantis tribe have, in general, at a little distance, so much the appearance of leaves of trees, that in countries where they are common, travellers have been struck with the singular phenomenon of what seemed to them animated vegetable substances. Their most prevailing colour is a fine green, but some of them are decorated with a variety of lively hues. The thorax in most of them is very long and narrow, and has the appearance of a foot-stalk to the large and rounded abdomen. Their manners, also, in addition to their structure, are very likely to impose on the senses. They often remain on the trees for hours without motion; then, suddenly rising, spring into the air, and, when they settle, again appear lifeless. These seem to be stratagems, as much to deceive the cautious

insects on which they feed, as to mislead their own assailants. One of these, the dry-leaf mantis, is so exceedingly remarkable, as to have uniformly suggested the idea of a dry or withered leaf; and the animal, when its wings are closed, bears so great a resemblance to such, that, on a cursory view, it might easily be taken for it.

Among fish, the frog-fish, the sole, and other flat fish are not to be distingushed from the mud on which they lie, and the former avails itself of this, and of a further peculiarity in its construction, to entrap its prey. Upon the head are two elongated appendages, the first of them broad and flattened towards the end, and having at this dilated part a shining silvery appearance. These elongated filaments are curiously articulated at the base with the upper surface of the head, and have great freedom of motion in any direction. Elevating these appendages, the fish moves them about in various directions by way of attraction as a bait, and the small fishes approaching either to examine or to seize them immediately fall a prey. The fulvous colour of the hare, and the attitude it assumes in its form, are so admirably adapted to secure its safety, that the animal seems to be conscious of their value by remaining perfectly quiet till it encounters the eye of its enemy or till the foot is in the act of touching it. The russet brown of the partridge, and indeed the sombre plumage of most of those birds, whose habits confine them chiefly to the ground, both for purposes of food and of nidification, are doubtless given them for protection and to enable them to escape the searching eyes of their numerous enemies.

There is no doubt that insectivorous animals can detect their prey in all its usual places of concealment,

as acutely as the practised eye of a naturalist, which can with ease perceive what escapes the observation of the inexperienced, and therefore the greater is the reason that some means or chances of escape should be given to the defenceless insect.

The caterpillar of a moth (*Noctua algæ*) is said to assume the colour of the lichens upon which it feeds, being grey when it feeds on a grey one (*Parmelia saxatilis*), and always yellow when it feeds on a yellow one (*Cetraria juniperina*). The caterpillar of the coronet moth (*Acronycta ligustri*), which feeds upon the privet, is so exactly of the colour of the underside of the leaf, to which it usually clings during the day, that a person may have the leaf in his hand without discovering the caterpillar. It would not be difficult to enumerate many other examples, and in some instances the protection is carried much further, for many of the caterpillars which feed on green leaves resemble in colour the grey or brown bark of the branches where they usually rest when not feeding. A marked instance of this occurs in the caterpillar of one of our largest and most beautiful moths (*Catocala fraxini*), the Clifden nonpareil, which feeds on the ash and the poplar, and is so similar to a stripe of brown lichen dotted with black, that it would not be readily discovered by any person but a naturalist.

The spectres (*Phasmatæ*) resemble the smaller branches of trees with their spray, and so minutely detailed is this mimicry that the very snags and knobs, as Kirby and Spence remark, are accurately imitated. Similar instances are by no means uncommon in some of our native caterpillars. That of the brimstone moth (*Rumia cratægata*) may often be found, appearing, as it stalks along, like a self-moving withered branch, the

skin being wrinkled and furrowed like the bark of the hawthorn on which it feeds, while the bulgings of the rings and a notched protuberance on the back add much to the resemblance. A similar walking branch caterpillar, that of the swallow-tail moth (*Ourapteryx sambucaria*), not so common as the preceding, but equally remarkable, may be found on the elder: its ringed bulgings are precisely like those of an elder branch, while the longitudinal stripes are like the cracks in the bark. It is worthy of remark that these caterpillars, when not feeding, rest upon their prolegs, with their body stretched out at various angles from the branch, their only support being a thread of silk, from which the head hangs, in order that they may be ready to drop down in safety, by extending their thread, on the sudden approach of enemies. As they feed chiefly in the night, they may be seen continuing in this stiff and singular attitude for a whole day without moving, "so that, doubtless," say Kirby and Spence, "the sparrows and other birds are frequently deceived by this manœuvre, and are thus baulked of their prey. A person, mistaking one of these caterpillars for a dead twig, started back in great alarm, when, upon attempting to break it, he found it was a living animal."

The surprising wisdom of these and similar arrangements in the economy of nature points clearly to the hand of a beneficent Creator, which is stretched forth even over the most defenceless of his creatures.

Connected with the plumage of birds is an extraordinary problem which has baffled all research, and towards the solution of which not the slightest approach has been made. Among certain of the gallinaceous birds, and it has been observed in no other family, the females occasionally assume the male plumage. Among

pheasants in a wild state, the hen thus metamorphosed, assumes with the livery a disposition to war with her own race, but in confinement she is spurned and buffeted by the rest. From what took place in a hen pheasant in the possession of a lady, a friend of the late Sir Joseph Banks, it would seem probable that this change arises from some alteration in the temperament at a late period of the animal's life. This lady had paid particular attention to the breeding of pheasants. One of the hens, after having produced several broods, moulted, and the succeeding feathers were exactly those of a cock. This animal never afterwards laid an egg. The pea-hen has sometimes been known to take the plumage of the cock bird. Lady Tynte had a favourite pea-hen, which at eight several times produced chicks. Having moulted when about eleven years old, the lady and her family were astonished by her displaying the feathers peculiar to the other sex, and appearing like a pied peacock. In this process the tail, which was like that of the cock, first appeared. In the following year she moulted again, and produced similar feathers. In the third year she did the same, and then had also spurs resembling those of the cock. The bird never bred after this change of her plumage.

LOCALITY, DISTRIBUTION.

NATURE has apportioned to every animal a locality conformable to its wants, whether as affording it the food proper to its existence, or as presenting the means of escape from its enemies. It is an established law that the borders of the elements are those which are

the most thickly inhabited; thus, the surface of the earth, and the lower regions of the air, swarm with animal life, while the depth of the earth, and the height above, are comparatively void. Again, the upper surface of the sea, within the influence of the atmosphere, is more populous than the extreme depths, and the coasts more than the surface: the borders of the forests are instinct with life, while their recesses are deserted, and the skirts of plains abound in animals, while the vastness beyond is almost untrodden.

Animals are spread largely over the various latitudes, and some can even live in different climates, but then they enjoy a peculiar organisation; the greatest part, however, cannot endure a change, and perish, like the sea-fish in fresh water, or the fresh-water fish in salt water, and for this reason, the spots, where the confluence of the two waters take place, are but little frequented on account of the absence of food.

A considerable number of insects are found on salt land. Darwin found the mud of the salt-lakes in Patagonia full of ringworms; and Schmarda says that he discovered many varieties of insects in the Salines of Capo d' Istria. The local distribution of terrestrial animals is very diversified.* Some inhabit the loftiest mountains; here the eagle builds its aërie, and the condor deposits its eggs on the bare rock; and here the chamois often laughs at the efforts of the hunter, astonishing him with the ease with which it scours over the rocks, or with which it ascends or descends the most inaccessible precipices.

Some animals that in high latitudes are found in the plains, in a warmer atmosphere seek the mountains. Of this description is the beautiful Apollo butterfly,

* Kirby.

which, in Sweden, is very common in the country and gardens about Upsala, while in France and Germany it is found only on mountains three or four thousand feet above the level of the sea. The common viper also, which, in northern Europe, is found in the plains, in southern is found only on alpine and sub-alpine mountains.

The majority of animals, however, do not ascend great heights, but seek their subsistence in the plains and less elevated regions; yet here a considerable difference obtains, according to the nature of the soil and country. The vast sandy deserts of Africa and Asia, the Steppes of Tartary, the Llanos and Pampas of South America, have their peculiar population; in the former the camel, and his master the Arab, whose great wealth he constitutes, are indigenous; in the latter the horse, and the Tartar, who rides and eats him; or the Hispano-American, and the herds of horses and oxen, returned to their wild and primitive type, who snares them with his lasso, and reduces them again to the yoke of man. Numerous also are the peculiar animal productions to which different soils afford subsistence. The sea-shore, sandy and barren wastes, woods and forests, arable lands, pasture, meadow and marsh, all are thus distinguished; every plant almost is inhabited by insects appropriated to it; every bird has its peculiar parasite or louse; and, not only are living animals so infested, but their carcases are bequeathed to a numerous and varied army of dissectors, who soon reduce them to naked skeletons; nay, their very excrements become the habitation of the grubs of sundry beetles and flies.

But not only is the surface of the earth and its vegetable clothing thickly peopled with animals, but many, even quadrupeds and reptiles, as well as insects

and worms, are subterranean, and seek for concealment in dens, caves, and caverns, or make for themselves burrows and tortuous paths at various depths under the soil, or seek for safety and shelter, by lurking under stones or clods, and all the dark places of the earth.

To other animals Providence has given the privilege to frequent both the *earth* and the *water;* some of which may be regarded as belonging to the former and frequenting the latter, as water-fowl of various kinds, the amphibious rat, the architect beaver, many reptiles, and some insects; others again, as belonging to the latter, and frequenting the former; for instance, the sea otter, and the different kinds of seal and morse, the turtle, the penguin, several insects, and the water-newts. Other amphibious animals, if they may be so called, are aquatic at one period of their life, and terrestrial at another; this is particularly exemplified in some insects, thus the grubs of water-beetles, those of dragon-flies, May-flies, ephemeral flies, water-moths, gnats or musquitos, and several other two-winged flies, live in the water, while the perfect insect is either amphibious, as the beetle, or terrestrial, as the remainder.

But no part of the terraqueous globe is more fully peopled, and with a greater variety and diversity of beautiful, or strange, or monstrous forms, than the waters, from the infinite ocean to the most insignificant pool or puddle. Every part and portion of the supposed element of water; nay, almost every drop of that fluid, teems with life. Thousands of aquatic species are known, but myriads of myriads never have been seen, and never will be seen by the eye of man.

Amongst those that inhabit fluids, none are more wonderful than those that are termed Infusories; because they are usually found in infusions of various

substances, &c. When dry, these animals lose all signs of life, but upon immersion, even after the lapse of years, they immediately awake from their torpor, and begin to move briskly about. Even the air, according to Spallanzani, seems to contain the germs or eggs of these infinitesimals of creation, so that we swallow when we breathe as well as when we drink.

With respect to animals more entirely *aquatic*, some inhabit, as the majority of sea fishes and animals, salt waters only; some salt at one time and fresh at another, as the species of the salmon genus, the sturgeon, &c.; and some frequent brackish waters, as some flat-fish and shell-fish.

The bed of the mighty ocean is not only planted with a variety of herbs, which afford pasture to many of its animal inhabitants, but it has other productions which represent a forest of trees and shrubs, and are, strictly speaking, the first members of the zoological world, connecting it with the vegetable: these are denominated Zoophytes, or animal plants, and Polypes. This last name has been adopted from Aristotle; with him, however, and the ancients, it is evidently used to designate the Argonaut and Nautilus of the moderns, and also to include some terrestrial shells. The zoophytes, however, are not confined to the ocean, for every rivulet and stagnant ditch or pool affords to some kinds, more commonly denominated polypes, and also to some sponges, their destined habitation. An infinite army of shell-fish, whether multivalve, bivalve, or univalve, also cover the bed of the ocean or move in its waters, and some dance gaily on its surface with expanded sails or dashing oars, when tempted by fair weather.

From this brief view of the local distribution of

animals and of their various haunts, we see the care of Divine Providence, that no place, however, at first sight, apparently unfit, might be without its animal as well as its vegetable population: if the hard rock is clothed with a lichen, the lichen has its inhabitant, and that inhabitant, besides affording an appropriate food to the bird that alights upon the rock, or to some parasite that has been hatched in or upon its own body, assists in forming a soil upon it. There is no place so horrible and fetid from unclean and putrid substances, that is not cleansed and purified by some animals that are either its constant or nomadic inhabitants. Thus life, a life attended in most cases, if not in all, with some enjoyment, swarms everywhere—in the air, in the earth, under the earth, in the waters: there is no place in which the will of an Almighty Creator is not executed by some being that hath animal life.

What Power is manifested in the organisation and structure of these infinite hosts of existence! What Wisdom in their adaptation to their various functions! and what Goodness and Love in that universal action upon all those different and often discordant creatures, compelling them, while they are gratifying their own appetites or passions, and following the lead of their several instincts, to promote the good of the whole system; combining into harmony almost universal discord, and out of seeming death and destruction bringing forth life and health and universal joy!

HABITATION.

This is either natural or artificial, dispensable or indispensable, congenital or adopted; and every animal, regulated by its appointed wants, if not naturally provided, seeks its asylum and protection accordingly. Snails and shell-fish are furnished by nature with a defensive covering, which is at the same time their habitation, and which they receive at their birth, and cannot, if they would, vary or forsake. It accommodates itself to their growth, and is at the same time sufficiently light as not to interfere with the movements and functions of the animal.* All the various tribes of shell-bearing animals are thus defended from the injuries or attacks to which their situation exposes them. These animals all have a soft body furnished with organs of different kinds, suited to their station and purposes. Those that are below them in the scale, especially the naked polypes and gelatinous radiares, are still more frail and evanescent; but their organisation is so inferior that it is probably less subject to derangement from external accidents, or injuries are sooner remedied, than in that of the shell-fish, which, unless they were clad in some kind of mail, would probably soon perish. Accordingly, we find some protected by a multivalve tubular shell, the inhabitant protruding its organs at the summit, which is defended by an operculum, consisting of more than a single piece; in others, also, the shell is univalve, but the

* Kirby.

animal protrudes itself at the sides, and has no operculum, as in the common barnacle. Others, again, are protected by a shell consisting of two valves, open at one or two ends, and these seek further protection either by burying themselves in the sand, or perforating the rocks, or by suspending themselves by a byssus; others again, which only open their shells at certain times, as the oyster, fix themselves to any convenient substance. To these succeed others, whose shell is transversely divided into many pieces (*Chiton*), but yet, taken together, it forms a single valve, protecting the back of a gastropod, or slug-like animal, which, for further protection, when it is not moving, and to supply the place of a lower valve, fastens itself to a rock or other substance.

With the Patellidans begin the undivided univalve shells, which, like the preceding animals, protect their lower side by fixing themselves to the rocks; the sea-ears (*Haliotis*), which are still more open, have recourse to a similar mode of protecting themselves. They preserve a communication with the atmosphere or water without elevating their shells, by means of a line of apertures, under the thickest margin near the apex; these apertures begin, when the animal is young, near the spire, and as it grows it stops up one and opens another, as its occasions require. If we turn from these to the Buccinidan or whelk tribe, we are struck by an open Peruvian shell, which at first sight seems like a limpet, but, upon enquiry we find that it is defended by an operculum, the plan of protection being here changed, and, instead of an undervalve or a rocky munition, it is closed by a broad plate.

In the common periwinkle, the mouth of its shell is closed by a horny organ called the *patch*, which is

attached to the foot, or rather neck, by its convex or lower surface, sitting on a sub-triangular flat space, spirally convoluted: this is the operculum. If we examine the opercula of other shells, we shall find the majority of them have the same spiral configuration traced both on the upper and lower surface. In most, the intervals of the whirls increase in width, as the spires of the shells do from the base to the mouth. In the top-shell (*Trochus*) the whirls are perfectly regular, and nearly equidistant, but vary much in thickness. As to substance, some are horny, while others resemble the shell; others are horny externally and shelly internally. If these formations on the under side, as in the common periwinkle, represent the shape of the part of the neck to which they are attached, as they most probably do, it must act the part of a mould, upon which the operculum is formed from its mucus, and increased as the aperture enlarges.

Lamarck is of opinion that the shell of univalves is formed in a similar way upon the *neck* of the animal, which in *Murices*, or rock-shells, and other tribes distinguished by spines or tubercles, has certain fleshy processes which produce these spines, &c., and are withdrawn when they have acquired consistence enough not to bend when thus left to themselves.

In the progress of a shell's growth, as these spines are formed, old ones drop off; but how this is effected seems not to be accounted for; it is analogous, however, in a great degree, to what was mentioned above with regard to the holes in the shell of the sea-ear, only that with them an old hole is stopped up when a new one is formed. All that can be said on the subject is, that the animal, instructed by Providence, as new processes are formed and a new whirl of its shell is completed, is

enabled to throw off by a solvent, or by some other means unascertained, those that are no longer wanted.

It is observable that the terrestrial univalves (*Helix*) of this order, are never armed with spines, tubercles, or other elevations, but exhibit generally a levigated shell. As they move about usually amongst bushes, under moss, or in grass, the object of the Creator of this structure was probably that their motions might not be impeded by any roughness of the shell.

The chalk-like cases which the polypes, or coral insects, form round themselves are a safe retreat for the animals, into which they can withdraw themselves. In one species, a remarkable arrangement is found; the upper openings of the cells in which they inhabit, have a vase-like form, shutting with a lid; when the animal wishes to expand itself, it opens the lid like a trap-door, and protrudes itself; and when it re-contracts itself and retreats, the lid falls, and closes the aperture so exactly that the animal is perfectly protected. A similar contrivance is found by the serpulæ and some gastropodes. But with these, as with the molluscæ and asterias, with the scales of fish and serpents, with the coats of mail and shields of the alligator, the tortoise, the manis, and the armadillo, this defensive covering—this portable habitation, is dependent on the bodily conformation of the animal, and not on its choice; and even in those cases where animals, like the spiders, spin themselves abodes, or contrive their webs for the capture of their prey, their acts are subservient to instinct, and it is only in the more perfect stage of intellect that natural materials, besides those proceeding from their own bodies, or the former exclusively, are used. Some few instances occur of animals appropriating the empty shells of others to their own use, as the hermit-crab

(*Cancer Bernhardus*), which having no shell to any part of its body, but the nippers, supplies by art what is denied to it by nature; for, taking possession of the deserted shell of some other animal, it occupies that, till, by becoming too large for its habitation, it is under the necessity of changing it.

It is curious enough, in some countries, to observe this animal busily parading the sea-shore, along that line of pebbles and shells which is formed by the furthest wave; still, however, dragging its old incommodious habitation at its tail, unwilling to part with one shell, even though a troublesome appendage, till it can meet with another more convenient. It stops first at one shell, turns it, passes by; then goes to another, contemplates that for a while, and, slipping its tail from the old habitation, tries it on the new. This also is found inconvenient, and it quickly resumes the old one. In this manner it frequently changes, till at length it finds one light, roomy, and commodious; to this it adheres, though the shell be sometimes so large as to hide both the body and claws of the animal.

But many trials and combats are sometimes to be sustained by the hermit-crab, before he is thus completely equipped; for there is often a contest between two of them for some favourite shell; they both endeavour to take possession, striking with their claws, and biting each other till the weakest is compelled to yield. The victor then takes possession, and in his new acquisition parades backward and forward on the strand.

That the ancients were well acquainted with the manœuvres of the hermit-crab, is evident from the following lines, translated from Oppian:—

> "The hermit-fish, unarm'd by nature, left
> Helpless and weak, grow strong by harmless theft.

Fearless they stroll, and look with panting wish
For the cast crust of some new-cover'd fish ;
Or such as empty lie, and deck the shore,
Whose first and rightful owners are no more.
They make glad seizure of the vacant room,
And count the borrow'd shell their native home ;
Screw their soft limbs to fit the winding case,
And boldly herd with the crustaceous race.
Careless they enter the first empty cell ;
Oft find the plaited whelk's indented shell ;
And oft the deep-dyed purple, forced by death,
To stranger fish the painted home bequeath.
The whelk's etch'd coat is most with pleasure worn,
Wide in extent, and yet but lightly borne.
But when they, growing, more than fill the place,
And find themselves hard pinch'd in scanty space,
Compell'd, they quit the roof they loved before,
And busy search around the pebbly shore,
Till a commodious roomy seat be found,
Such as the larger shell-fish living own'd.
Oft cruel wars contending hermits wage,
And long for the disputed shell engage.
The strongest here the doubtful prize possess,
Power gives the right, and all the claim possess."

Of the cowries (*Cypræa*), a very remarkable fact has been stated by M. Bruguière; that when the animals find their shells too small for the increased dimensions of their body, they quit them, and proceed to the formation of new ones of larger size, and consequently better adapted to their wants. As soon as the cowry has abandoned its covering, the hinder parts of its body begin to furnish anew the testaceous matter, which is afterwards condensed upon its surface. This secretion is continued, until at length the shell appears of the consistence of paper; and the mouth or opening of the shell, which at this period is very wide, soon afterwards contracts to its proper form and dimensions. The edges are thickened, and form into those beautiful folds or teeth, which are so remarkable on each side of the

opening of these shells; and by means of the membranaceous wings of the animals, the highly polished surface of the whole exterior of the shells is by degrees completed.

Lobsters cast their shells annually. Previously to putting off their old one, they appear sick, languid, and restless. They acquire an entirely new covering in a few days; but during the time that they remain defenceless, they seek some lonely place, lest they should be attacked and devoured by such of their brethren as are not in the same weak condition. In casting their shells, it is difficult to conceive how the lobsters are able to draw the flesh of their large claws out, leaving the shells of these entire and attached to the shell of the body. The fishermen say, that previously to the operation the lobster pines away, till the flesh in its claw is no thicker than the quill of a goose, which enables it to draw its parts through the joints and narrow passage near the trunk. The new shell is membranaceous at first, but it hardens by degrees.

Among those creatures which employ foreign substances in the construction of their habitations, there is a distinction, that they either occupy them for the periods of their lives, like the ship-worm (*Teredo navalis*), that bores into the bottoms of ships and piles, which, on being split lengthwise, are found full of large passages, or hollow, cylindrical ducts, each of which contains a worm, enclosed in its testaceous tube, which it exactly fills; the Dactyle Pholas, which penetrates into rocks, and there forms a habitation, from which it never removes, and seems perfectly content with being enclosed in its own sepulchre; the razor-shell (*Solen*), which burrows in the sand, sometimes to the depth of two or three feet, and never quits the burrow

unless by force;—or only seek shelter there from time to time, which is the habitation in its strict sense. The first indication of this is found in the holes which snails prepare for their hybernation.

Crustaceæ and centipedes conceal themselves chiefly under stones, many of the former digging little cavities in the soil, as the fresh-water craw-fish, which excavates a hole by the sides of streams; the land-crab (*Gelasimus*), described by Sir Joseph Banks, which inhabits holes, has one claw of such disproportionate size, that it uses it to block up the entrance to its hole in moments of danger.

Many spiders prepare a web for their protection, although the most employ it for predatory purposes; and some again envelope their eggs with such material; and hence Menge distinguishes it as residence, net, and nest. One of the most singular constructions belongs to the trap-door spider (*Cteniza*), a species of which is described by M. Audoin, under the name of *pioneer* or *fodiens*. He says, some spiders are gifted with a particular talent for building; they hollow out dens; they bore galleries; they elevate vaults; they build, as it were, subterranean bridges; they construct, also, entrances to their habitations, and adapt doors to them, which want nothing but bolts, for, without any exaggeration, they work upon a hinge, and are fitted to a frame. The habitations of the species in question are found in an argillaceous kind of red earth, in which they bore tubes about three inches in depth, and ten lines in width. The walls of these tubes are not left just as they are bored, but are covered with a kind of mortar, sufficiently solid to be easily separated from the mass that surrounds it, and as smooth and regular as if a trowel had been passed over it, and this

is covered with some coarse web on which is glued a silken tapestry. If this passage were always left open, the spider would be subject to intrusion and attack; she has, therefore, been instructed to fabricate, a very secure trap-door, which closes the mouth of it. To judge of this door by its outward appearance, we should think it was formed of a mass of earth, coarsely worked, and covered internally by a solid web; which would appear sufficiently wonderful for an animal that seems to have no special organ for constructing it: but if it be divided vertically, it will be found a much more complicated fabric than its outward aspect indicates, for it is formed of more than thirty layers of earth and web, emboxed, as it were, in each other, like a set of weights for small scales.

If these layers of web be examined, it will be seen that they all terminate in the hinge, so that the greater the volume of the door, the more powerful is the hinge. The frame in which the tube terminates above, and to which the door is adapted, is thick, and its thickness arises from the number of layers of which it consists, and which seem to correspond with those of the door; hence, the formation of the door, the hinge, and the frame, seem to be a simultaneous operation; except that in fabricating the first, the animal has to knead the earth, as well as to spin the layers of web. By this admirable arrangement, these parts always correspond with each other, and the strength of the hinge, and the thickness of the frame, will always be proportioned to the weight of the door. If we examine the circular margin of the door, we shall find that it slopes inwards, so that it is not a transverse section of a cylinder, but of a cone, and, on the other side, that the frame slopes outwards, so that the door exactly applies to it. By

this structure, when the door is closed, the tube is not distinguishable from the rest of the soil, and this appears to be the reason that the door is formed with earth. Besides, by this structure also, the animal can more readily open and shut the door; by its conical shape it is much lighter than it would have been if cylindrical, and so more easily opened, and by its external inequalities, and mixture of web, the spider can more easily lay hold of it with its claws. Whether she enters the tube or goes out, the door will shut of itself.

The most powerful instinct which belongs to insects is that which has regard to the preservation of their species. We find, accordingly, that as the necessity for their preservation is of the utmost importance in the economy of nature, so for this especial object many insects, whose offspring, whether in the egg or larva state, are peculiarly exposed to danger, are endued with an almost miraculous foresight, and with an ingenuity, perseverance, and unconquerable industry, for the purpose of avoiding those dangers, which are not to be paralleled even by the most singular efforts of human contrivance. The same ingenuity which is employed for protecting either eggs, or caterpillars and grubs, or pupæ and chrysalides, is also exercised by many insects for their own preservation against the changes of temperature to which they are exposed, or against their natural enemies. Many species employ those contrivances during the period of their hybernation, or winter sleep. For all these purposes some dig holes in the earth, and form them into cells; others build nests of extraneous substances, such as bits of wood and leaves; others roll up leaves into cases, which they close with the most curious art; others build a house of mud, and line it with

the cotton of trees, or the petals of the most delicate flowers; others construct cells of secretions from their own bodies; others form cocoons, in which they undergo their transformation; and others dig subterranean galleries, which, in complexity of arrangement, in solidity, and in complete adaptation to their purposes, vie with the cities of civilised man. The contrivances by which insects effect these objects have been accurately observed, and minutely described, by patient and philosophical inquirers, who knew that such employments of the instinct, with which each species is endowed by its Creator, offered the most valuable and instructive lessons, and opened to them a wide field of the most delightful study. The construction of their habitation is certainly among the most remarkable peculiarities in the economy of insects, whether they be the separate work of one individual, or the joint labour of a vast community.

The structures of wasps and bees, and still more those of the wood-ant (*Formica rufa*), when placed in comparison with the size of the insects, equal our largest cities compared with the stature of man; but if we look at the buildings erected by the white ants (*Termites*) of tropical climates, all that we have been surveying dwindles into insignificance. Were our houses built according to the same proportions, they would be four or five times higher than the pyramids of Egypt, with corresponding dimensions in the basements of the edifices. The termites do not stand above a quarter of an inch high, while their nests are frequently twelve feet. Bishop Heber saw a number of these high ant-hills in India, near the principal entrance of the Sooty or Moorshedabad river. "Many of them," he says, "were five or six feet high, and probably seven or eight feet

in circumference at the base, partially overgrown with grass and ivy, and looking at a distance like the stumps of decayed trees."

The Caddis worms, or larvæ of the four-winged flies in the order Trichoptera, live under water, where they construct for themselves moveable habitations of various materials, according to their habits or to the substances most conveniently procured, such as sand, stones, shells, wood, and leaves. One of these grubs forms a case of leaves glued together longitudinally, but leaving an aperture sufficiently large for the inhabitant to put out its head and shoulders when on the look-out for food; another employs pieces of reed, grass, straw, or wood carefully joined and cemented together; another makes choice of the tiny shells of young fresh-water mussels and snails (*Planorbis*) to form a moveable grotto, and as these little shells are for the most part inhabited, he keeps the poor animals close prisoners, and drags them along with him. But one of the most surprising instances of their skill occurs in the structures of which small stones are the principal materials. The problem is to make a tube about the width of the hollow of a wheat-straw, and equally smooth and uniform; and as the materials are small stones, full of angles and irregularities, the difficulty of performing this problem will appear to be considerable, if not insurmountable; yet the little architects, by patiently examining their stones, and turning them round on every side, never fail to accomplish their plans. This, however, is only part of the problem, which is complicated with another condition, namely, that the under surface shall be flat and smooth, without any projecting angles which might impede its progress when dragged along the bottom of the rivulet where it resides. In some instances where

these little cases are found to possess too great a specific gravity, a bit of light wood or a hollow straw is added to buoy them up.

Fish, from the nature of the element they inhabit, and their power to migrate or to descend to greater depths according to the seasons, do not attempt to form any artificial abode. The black goby (*Gobius niger*) is said to form runs in the clay, in which it passes the greatest part of the year, secure from cold, storms, and enemies. In the spring it approaches the shallows, where it forms deeper channels, and deposits its spawn. The same power is attributed to the stickleback, and the salmon also forms a cavity in the mud for the reception of its spawn.

Newts, frogs, and toads make themselves holes, in which they hybernate, and retreat to for safety while renewing their skin. Snakes and lizards also hybernate in holes in the earth, and fly to the nearest in moments of danger.

However great the skill of architecture in insects, it attains, if possible, a higher degree of perfection in birds, which employ almost exclusively foreign materials for the purpose, collected and adapted in the most artistical manner. There are very few which do not construct nests; as the cuckoo, and the cow-bird of America, and as, among the water-birds, the petrels and razor-bills, which deposit their eggs on the bare rock. Others of the race, like the puffins and penguins, excavate long burrows. The former, in the breeding season, visit several places on our coasts, particularly the small island of Priestholm, near Anglesea, which might be called Puffin Island, as the whole surface appears literally to be covered with them. Soon after their arrival in May, they prepare for breeding; and it is said that the male,

contrary to the usual economy of birds, undertakes the hardest part of the labour. He begins by scraping up a hole in the sand, not far from the shore; and after having got to some depth, he throws himself on his back, and with his powerful bill as a digger, and his broad feet to remove the rubbish, he excavates a burrow with several windings and turnings, from eight to ten feet deep. He prefers, when he can find a stone, to dig under it, in order that his retreat may be more securely fortified. Whilst thus employed, the birds are so intent upon their work that they are easily caught with the hand. Professor Hooker says: "In one part of the island where there is a considerable quantity of rich loose mould, the puffins breed in vast numbers, forming holes three or four feet below the surface, resembling rabbit-burrows, at the bottom of which they lay a single white egg, about the size of that of the lapwing, upon the bare earth."

The penguin, whose long and narrow bill seems less strong for digging than that of the puffin, contrives to form extensive burrows in the desolate islands it frequents. They select for nestling a sandy plain or down, where they usually congregate in such numbers as everywhere to undermine the ground; so that in walking it is not unusual to sink up to the knees, but if the penguin chance to be at home, she revenges herself upon the passenger who has destroyed her roof, by fastening on his legs and biting him severely. The species are so numerous on most of the uninhabited islands of the South Seas, on both sides of Cape Horn, and the Cape of Good Hope, that Pyrard says, One cannot stir a step without crushing their eggs or their young. The kingfisher also uses a hole for the purpose of incubation, but it is doubtful whether it selects

the old hole of a water-rat to save itself trouble, and it seems to indicate a dislike to the labour of digging, as it frequents the same hole for a series of years, and will not abandon it, though the nest be repeatedly plundered. Up to the present time, more or less misrepresentation has been introduced into the description of this burrow. Gesner furnishes it with a soft bed of reed-flowers; Goldsmith says it lines its hole with the down of the willow; and Colonel Montague asserts that at the end of the hole there is a kind of bedding formed of the bones of small fish, evidently the castings of the parent birds, mixed with earth. The burrowing owls found in some of the warmer districts of America, are another and singular instance, from their inhabiting the same holes, and certainly the same villages, as they are termed, with the prairie-dog and the marmot. The pelican tribe make a very artless nest from sea-weed; and the same absence of arrangement pervades the gallinaceous tribes, including also the ostrich and bustard, all of which are contented with merely scratching a hole in the earth, without even the addition of leaves or straw as a protection. The nest of the wild turkey is of a very simple structure, being composed of a few dried leaves only, but concealed as much as possible, to guard against the predatory attacks of the crow.

The great majority of birds, however, build the most artistical nests, selecting situations according to their habits, either on the ground, in shrubs, in trees, on rocks, and even on human dwellings; and it is a received opinion with many that the more perfect the nature of the bird, the higher from the ground is the nest constructed.

The greatest variety prevails in the construction, and without exception the materials consist of bad

conductors of heat: thin twigs, grasses, fibres of plants, &c., lined with hair and feathers, and some few are formed of mud or clay. The shape is chiefly hemispherical, and rarely otherwise in this country, and Hill states in confirmation that in the tropics the nests of birds are more often spherical than in other countries, for two obvious reasons; for protection, namely, to the bird against the climate while sitting, and against the attack of snakes and monkeys. And besides, the birds which build such nests breed in the season which intervenes between the spring and the autumnal rains, when the air is particularly charged with electricity and subject to sudden changes of temperature, a condition particularly injurious to animals of dull respiration and of great excitability. The unhatched bird is in an inferior state of organisation, and therefore its existence is endangered by any strong electrical rarefaction of the air and by continual atmospherical changes; but from the peculiarity of the materials employed in the nest, the eggs are, as it were, insulated and protected, and the act of incubation goes on in perfect security in the midst of an atmosphere loaded with electricity.

The black and blue humming bird builds its nest of long grass in the form of a retort, hanging from the top of a cane or bamboo: the entrance to the neck, which is a foot long, is from beneath, so that the bird has to climb up as through the nose of a funnel, and then both the situation and form of the nest protect it fully from snakes and monkeys. A species of oriole (*Nidipendulus*) builds a similar nest, but with the entrance from above, and they are not unfrequently seen on the further twigs of high trees, when the leaves, which hid them, have fallen off. The Baltimore bird, seeking materials for

its nest, when the women hang out their thread to bleach, perceives that this will suit it, and carries it off. Skeins of silk and hanks of thread have often been found hanging round its nest, but so woven up and entangled as to be irreclaimable.

One of our indigenous birds, the long-tailed titmouse, builds a singularly curious and elegant nest, of a long oval form, with a small hole in the side near the top as an entrance: the outside is formed of moss, woven or matted together with the silken shrouds or aurelia of insects, and covered all over with the tree and stone lichens, fixed with fine threads of the same silken material. From this thatch the rain trickles off without penetrating, whilst from its similarity in colour and appearance to the bark of the branch, or the foliage of the shrub on which it is placed, it is not easily discovered. The inside is thickly lined with a profusion of feathers, the soft webs of which are laid inwards, with the quills or points stuck into the outward fabric; but the most extraordinary performance is perhaps that of the tailor-bird (*Sylvia sutoria*), the description of which would be suspected for an oriental fiction were not the authenticity placed beyond all doubt. This bird will not entrust its nest to the extremity of a slender twig, but makes one more advance to safety by fixing it to the leaf itself. It picks up a dead leaf, and sews it to the side of a living one, its bill being its needle and its thread some fine fibres: the lining consists of feathers, gossamer, and down, and these slight materials, therefore, added to the weight of the bird, which is only three-sixteenths of an ounce, are not likely to draw down a habitation so delicately suspended.

"Behold a bird's-nest!
Mark it well, within, without!
No tool had he that wrought; no knife to cut,
No nail to fix, no bodkin to insert,
No glue to join; his little beak was all:
And yet how nicely finish'd! What nice hand,
With every implement and means of art,
Could compass such another?"

It is in their nests that birds display the most striking and varied indications of contriving and judging, and therefore of thinking intellect, confined, indeed, in the extent of its operations, but resembling reasoning intellect within this compass. The birds of the Indian climates are obliged to exert unusual artifice in placing their broods out of the reach of an invader. Each aims at the same end by different means. Some form their pensile nest in the shape of a purse, deep, and open at the top; others with a hole at the side; and others, still more cautious, with an entrance at the very bottom, forming their lodge at the summit. This instinct prevails also among the birds on the banks of the Gambia, which abounds with monkeys and snakes. Others, for the same end, make their nests in the holes of the banks that overhang the river.* The lesser species, having a certain prescience of the dangers that surround them, and of their own weakness, suspend their nests at the extreme branches of trees. They are conscious of inhabiting a climate replete with enemies to them and their young—with snakes that twine up the bodies of the trees, and apes, that are perpetually in search of prey; but, heaven-instructed, they elude the gliding of the one and the activity of the other.

* Pennant.

The eagle has but one enemy, man, and to secure itself from him, it seeks the most inaccessible rock, or the loftiest tree on which to construct its nest. It is composed of great sticks, as rafters, united strongly together with smaller and more flexible branches, on which is piled a considerable quantity of brushwood, moss, heath, and even rushes, if they are to be found in the vicinity, forming a mass of four or five feet in diameter, and two feet thick, without a hollow in the centre. The birds use the same nest for a succession of years, and some of the species, as the fish-hawk of America, leave their breeding place in the autumn, like our own rooks; and like them also, before departing, regularly repair their nests, carrying up sticks, sods, &c., to fortify them against the violence of the winter storms. This indicates a very remarkable degree of prospective contrivance, irreconcileable with the common theories of instinct.

Not to multiply examples where all are wonderful, it is only necessary to turn to the swallow, whose mode of operation is so entirely dissimilar from all others. The crust or shell of its nest seems to be formed of such mud or loam as comes most readily to hand, tempered and wrought together with little bits of broken straws to render it tough and tenacious; and that the work may not, while it is soft and green, pull itself down by its own weight, the bird has prudence and forbearance enough not to advance its construction too fast. About half an inch seems to be a sufficient layer for a day, and thus in about ten or twelve days a hemispheric nest is formed with a small aperture towards the top, compact and warm and perfectly adapted to its purposes. The shell or crust is a sort of rustic work, full of knobs and protuberances on the outside, but the inside is

smoothed with more care, and in some instances has even a glazed appearance.

Some birds invade the nests of others and appropriate them; others, under a sense of security, or from some eccentricity of purpose, select situations the most singular and at variance with their habits: thus a pair of swallows at Camerton Hall, near Bath, built their nest on the upper part of the frame of an old picture over the chimney-piece, coming through the broken pane in the window of a room, and using it for three years successively till the room was put into repair and their future entrance stopped. Besides the many small rookeries which exist in gardens in London, there has been for several successive years a single rook's nest in the tree at the corner of Wood-street, Cheapside; and some years ago a pair of these birds built their nest on the top of the vane of the Exchange at Newcastle, and brought forth their young, undisturbed by the noise of the populace below them; the nest and its inhabitants turning about with every change of wind. This was continued for ten years, when the spire was taken down.

A labouring man of the village of River near Dover, reared a young hen-blackbird in the spring of 1844, and succeeded so perfectly in domesticating it, that it was allowed its full libery, flying in and out of the house at will, and roosting in the little kitchen parlour. Early in the spring of 1845 it disappeared, and was mourned as lost, but at the expiration of a few weeks it returned, followed by a mate, which, encouraged by the fearlessness and impunity of its partner, threw off some of its natural timidity, and ventured to take its stand on the sill of the window, beyond which it never ventured. The hen bird constructed its nest in the

room, hatched and reared its young ones, and at length flew off together with them. In the spring of 1846 it again returned under the same circumstances, the male bird frequenting its old position in the window, and again a nest was begun, but the position selected on the little dresser between two plates was so inconvenient to the woman of the house, that she deranged it; but it was of no avail, for that was the place decided on, and another nest was begun. The good woman took in washing, and, having occasion to go out for a short time, she left some lace she was ironing on the table. On her return, she found the lace had been appropriated by the bird, which had interwoven it beautifully in the nest, in which it was then seated. Loth to disturb her favourite, and yet fearful of being blamed by her employer, she went to the lady, and begged her to see the nest and to judge what was to be done. The result was that the bird was left undisturbed, and reared its young in safety, the male bird assisting in the task of bringing food to the window, which the female received and carried to the nestlings; and often, when picking up crumbs from the table, she would carry them to her mate, feeding him with the dainties he was afraid to take himself.

The sociable grosbeak of Africa is one of the few instances of birds living in community and uniting in constructing one huge nest for the whole society. Le Valiant's account has been fully confirmed by other travellers; he says, "I observed, on the way, a tree with an enormous nest of those birds, which I have called republicans: and, as soon as I arrived at my camp, I dispatched a few men with a waggon to bring it to me, that I might open and examine the hive. When it arrived, I cut it in pieces with a hatchet, and saw that

the chief portion of the structure consisted of a mass of Boshman's grass, without any mixture, but so compact and firmly basketed together, as to be impenetrable to the rain. This is the commencement of the structure, and each bird builds its particular nest under this canopy. But the nests are formed only beneath the eaves, the upper surface remaining void, without, however, being useless; for, as it has a projecting rim, and is a little inclined, it serves to let the water run off, and preserves each little dwelling from the rain. Figure to yourself a huge, irregular sloping roof, all the eaves of which are completely covered with nests, crowded one against another, and you will have a tolerably accurate idea of these singular edifices.

"Each individual nest is three or four inches in diameter, which is sufficient for the bird; but, as they are all in contact with one another, around the eaves, they appear to the eye to form but one building, and are distinguishable from each other only by a little external aperture, which serves as an entrance to the nest; and even this is sometimes common to three different nests, one of which is situated at the bottom, and the other two at the sides. This large nest, which was one of the most considerable I had any where seen in the course of my journey, contained three hundred and twenty inhabited cells, which, supposing a male and female to each, would form a society of six hundred and forty individuals; but, as these birds are polygamous, such a calculation would not be exact."

The Mammalia which burrow, particularly those which not only live beneath the surface, but obtain their food there, form often a complete labyrinth of subterranean passages. Several of these construct a chamber or vault at the utmost extremity of the burrow, con-

tracting the passages in the neighbourhood of it, so that no animal larger than themselves can penetrate. Many have, besides the places which they usually inhabit, others which they can fly to in case of danger, as the fox, the beaver, the field mouse, the squirrel, &c., and additional outlets are also provided to facilitate the means of escape. Amphibious animals are mostly content with concealing themselves simply in holes, or with forming a subterranean passage of some depth, with one entrance in connection with the water, and with another on the bank, generally concealed by the gnarled roots of a tree or a thick bush; thus the otter, in this country, and the ornithorhynchus, of New Holland, which forms burrows of from twenty to fifty feet long with a double entrance. Many Mammalia, as the pachyderms, ruminants, and the larger predaceans, have no habitation, as they are either secure from danger in their own bodily strength, or because they roam so wide in search of food, that a fixed home would be as impossible as useless; monkeys and sloths are equally independent of habitations, as they live entirely in trees; but the greatest number of the rodents and the lesser predaceans, inhabit dwellings, which are generally most artistically contrived. Those of the beaver are familiarly known.

Some animals and birds appropriate and even invade the dwellings of others. The bank-swallow frequently adopts the forsaken hole of the water-rat; the hawk possesses itself of the nest of the crow; and sparrows, not content with occupying by forestalment the nest of the swallow, will attack the rightful owner with a view to dispossess it. The shrew-mouse, unable to penetrate the hard ground with its weak feet, shelters itself in the runs of the mole; and the martin not unfrequently

seizes the nest of the crow or of the squirrel, and converts it to his own purposes.

Most animals conceal not only their dwellings, but even the approaches to them. Wasps contrive a long subterranean, tortuous gallery as the entrance to their nest; and the emmets or jet-ants form covered ways to the tree which they inhabit. A mason-wasp was observed on the wall of a house at Lee, in Kent, busily employed in excavating a hole in one of the bricks at a little height from the ground. Whether there might not have been an accidental hole in the bricks, before the wasp commenced her labours, is unknown, as she had made considerable progress in the work when first observed. The most remarkable circumstance in the process of hewing into the brick, was the care of the insect in removing to a distance the fragments which from time to time she succeeded in detaching. It might have been supposed that these fragments would have been tossed out of the hole as the work proceeded, without further concern, as the mole tosses above ground the earth which has been cleared out of its subterranean gallery; but the wasp was of a different opinion, for it was possible that a heap of brick chips, at the bottom of the wall, might lead to a discovery of her nest by some of her enemies, particularly by one or other of the numerous tribes of what are called ichneumon flies. Most of the smaller birds conceal their nests in thick bushes, or cover them externally with a material of the same colour as the surrounding objects. Ostriches conceal the position of their nests by making a circuit when they leave or approach them; and larks and nightingales neither fly to nor from their nests direct, but creep for some little distance through the grass and shrubs as a blind. The wild turkey, some of the grouse

and duck tribes, the moorhen, and others, when they absent themselves from their nests, cover them so completely with leaves and moss, that the most experienced eye cannot detect them. The fox, too, never returns to its earth in a straight line, and seldom commits any depredations in its immediate neighbourhood, and further, never allows any bones or refuse to be seen about the entrance.

CLEANLINESS.

Most animals keep their habitations perfectly clean, and this cleanliness extends equally to their bodies. Many insects and spiders are furnished with hairy feet, with which they brush themselves, cleansing them afterwards with their jaws; crickets and grasshoppers draw their antennæ through their palpi to keep them in order; the larva of the May-bug cleans itself with its tail, which has a little brush-like tuft. The middle claw of the goatsucker is serrated for the purpose of arranging the bristly appendages of the bill; and other birds preen themselves with their bills, smoothing and cleaning their feathers. Deer, cattle, and horses lick themselves, and the cat wets its paws with its saliva, and rubs its head and those parts which it cannot reach with its tongue. Burrowing and climbing animals constantly clean themselves with their fore paws. The bat keeps the hair of its coat in order with its hind feet, and passes its tongue over its wings. Many animals and birds either bathe in the water or wallow in the same, and some of the former enjoy rubbing themselves against posts and trees.

Bees are remarkable for the cleanliness of their dwellings; they are extremely solicitous to remove such insects or foreign bodies as happen to get admission into the hive. When so light as not to exceed their powers, they first kill the insect with their stings, and then drag it out with their jaws. But it sometimes happens that an ill-fated snail creeps into the hive; this is no sooner perceived than it is attacked on all sides, and stung to death. But to attempt to carry out so heavy a burthen would be labour in vain, and therefore, to prevent the noxious smell which would arise from its putrefaction, they immediately embalm it, by covering every part of its body with propolis, through which no effluvia can escape. When a snail with a shell gets entrance, the disposal of it gives much less trouble and expense to the bees. As soon as it receives the first wound from a sting, it naturally retires within its shell. In this case, the bees, instead of pasting it all over with propolis, content themselves with gluing all round the margin of the shell, which is sufficient to render the animal for ever immovably fixed.

An adder, which was kept for a considerable time in a box, took every opportunity to crawl out, in order to perform its natural functions in a distant corner. Birds, with very few exceptions, preserve the greatest cleanliness in their nests, by throwing over the side the dung of their young ones, which, as they attain strength, protrude their bodies over the rim of the nest, and avoid all impurities within.

Many burrowing animals, like the pole-cat and beaver, discharge themselves outside of their dwellings, and the former removes to a distance the excrement of its young; the mole sets apart a division of its run for its wants, and the cat and jackall bury their matter.

Rats are so tenacious of cleanliness that they will not pass through a hole which has been smeared with tar or any other adhesive substance.

Three elements of great importance in the rearing of swine, are to keep them comfortably warm, to afford them a constant supply of fresh air, and to keep them perfectly free from every kind of impurity. A close, ill-ventilated sty has an absolutely pestilential atmosphere, makes pigs look delicate and sickly, undermines their very constitution, and prevents them from ever attaining proper size and weight; while a sty with an open-barred door, and a constant current of fresh air, maintains them in vigour, gives them the full advantage of their food, and affords full and facile scope for their rapid growth and ample maturation. Cleanliness, not only of the litter and of the floor of the sty, but of the feet and of all the skin of the animals themselves, is essential to the energetic performance of the organic functions, and even to the prevention of comparative dwarfishness and in some measure of disease. The propensity of swine to roll themselves in the mud in summer, only proves that they require protection from the scorching heat of the sunshine, and from the attacks of flies, and affords not the remotest indication that any daubing of the pores with dirt can possibly be beneficial. A washed sow in the hot season of our temperate climate, and in almost every season of such a climate as that of Palestine, "returns to her wallowing in the mire," simply because she feels scorched, and blistered, and sickened, under the ardent sunshine; and hence, when she receives from man the aid which is due to her as a domesticated animal, she demands not dirt all the year through, nor any day at all, but shade in summer, shelter in winter, and a clean dry bed in every season. Of six

pigs, of nearly equal weight, kept for seven weeks on the same food and litter, three were maintained as clean as possible with brush and curry-comb, and were found, at the end of the seven weeks, to have consumed five bushels less of peas than the other three, and yet to have acquired two stones and four pounds of greater weight of carcase.—*Rural Cyclopædia.*

CHANGES OF HABITATION.—PARTIAL MIGRATION.

In moments of danger many animals quit their accustomed abodes, and even endeavour to seek safety in another element than their own, as the flying-fish, which takes a flight of from fifty to a hundred yards to avoid its enemy the dolphin, displaying a voluntary exertion in the emergency of the danger in order to escape it—a spontaneous motion for a reasonable purpose, at the proper moment, and continued as long as the necessity lasts, or the ability to perform it, remains. All the activity of mind, which both hare and hound display in a rural chase, was exhibited in the accidental pursuit of these fishes by the dolphin, which Captain Basil Hall has so interestingly described:—

"About a dozen flying-fish rose out of the water, and skimmed away to windward at the height of ten or twelve feet. A large dolphin that was keeping company at the depth of two fathoms, and glistening beautifully in the sun, no sooner saw them, than he turned his head toward them, and, darting to the surface, leaped from the water with a velocity little short of a cannon ball. The length of his first spring

was ten yards; but they kept a-head of him. After he fell, we could see him gliding through the water for a moment; then he rose, and shot forward with a still greater velocity, and to a still greater distance. In this manner he pursued them, while his brilliant coat sparkled and flashed in the sun. The flying-fish, thus hotly pursued, dropped into the sea, to set off again in a fresh and more vigorous flight, but took a different direction, implying that they had detected their enemy, who was now gaining upon them. His pace was two or three times as swift as theirs. Whenever they varied their flight in the smallest degree, he lost not the tenth part of a second in shaping a new course, so as to cut off the space; while they in a like manner, not unlike that of a hare, doubled more than once upon the pursuer. As they became exhausted, he seemed so to arrange his springs that he contrived to fall at the end of each just under the spot where they were about to drop. We saw them, one after another, drop into his jaws as they lighted on the water, or were snapped up immediately afterwards." They are sometimes in danger from sea birds while in the air; but this coincidence of their presence cannot very often occur. The casual incident has been dolorously magnified into an habitual circumstance, and the fish supposed therefore to lead a miserable life. It is most probable that having the power of the aerial excursion it often uses it for its own amusement.

The fish which climbs trees (*Perca scandens*, inhabiting the rivulets in Tranquebar,) displays an equal exertion of peculiar will, though its exact intention is not known, beyond the general idea that it is seeking for food or something agreeable to its perception. The salmon exhibits a remarkable instance of determined effort to

effect a rational purpose in the extraordinary leaps which it makes to surmount cataracts or other obstacles which impede its progress as it ascends a river. This requires not only will, but correct perception and judgment, as its muscular exertion must be regulated by the extent and nature of the hindrance which it meets with, and by a perception of the height to which its spring must reach.

The periodical migrations of many tribes, for the purpose of fecundating and depositing their eggs, display a mental instinct in rational, persevering, and efficacious operation. The same combination of action and judgment appears in the fish that crawls on land in search of water, the *Callichthys Silurus,* which inhabits small running streams in Europe, and crawls, when these are dried up, across meadows in search of water. When confined, it is said to perforate the sides of reservoirs for the purpose of making its escape. The night journies of eels for obtaining food are of the same description, and they are often found wandering along meadows in search of snails and worms.

The water newt, when its pond is dried up or drained, wanders forth to seek another spot, and hence it has been often found in fields and woods away from any water.

Dr. Hancock, in the "Zoological Journal," gives an account of a species of fish, called by the Indians, the Flat-head Hassar, belonging to a genus (*Doras*) of the family of the Siluridans, which are instructed by their Creator, when the pools in which they reside lose their water in very dry seasons, to take the resolution of marching by land in search of others in which the water is not evaporated. These fish grow to about the length of a foot, and travel in large droves with

this view: they move by night, and their motion is said to be like that of the two-footed lizard (*Bipes*). A strong serrated arm constitutes the first ray of its pectoral fin, and using this as a kind of foot, it should seem, they push themselves forwards by means of their elastic tail, moving nearly as fast as a man will leisurely walk. The strong plates which envelope the body, probably facilitate their progress in the same manner as those under the bodies of serpents, which in some degree perform the office of feet. It is affirmed by the Indians that they are furnished with an internal supply of water sufficient for their journey, which seems confirmed by the circumstance that their bodies when taken out of the water, even if wiped with a dry cloth, become instantly moist again. Another migrating fish abounding in the pools of Carolina, which are subject to be dry in summer, is furnished, by means of a membrane which closes its mouth, with the faculty of living out of water and of travelling by leaps to discover other pools.

Among the casual migrations which take place under a certain pressure, come those mighty armies of locusts, which, when they have laid bare one country, as an overshadowing and dark cloud pregnant with the wrath of heaven, pass on to another, carrying devastation and ruin in their progress,—to use the graphic language of the prophet,—"the land is as the garden of Eden before them, and behind them a desolate wilderness."

Amongst quadrupeds, the analogues, in some respects, of the locusts, are the lemmings, a kind of mouse or rat. These little animals, which usually inhabit the mountains of Norway and Lapland, in certain seasons emigrate in prodigious numbers to the south, marching straight forward, neither turning to the right hand nor

to the left; and if their course be interrupted by a river, they cross it by swimming. They are regarded as a terrible scourge, as they devastate the fields and gardens, ruin the harvest, and only what is kept in the houses escapes them, into which, happily, they never enter. Their number is so prodigious, that, when they die, the air is infected, and much sickness is the consequence. The campagnol (*Arvicola arvalis*), or short-tailed rat of Pennant, is equally destructive. In some years their numbers are so prodigious, that they overflow, as it were, a whole district, and, by their ravages, produce famine and desolation. This effect is stated to have been produced in certain parts of France, where an extent of forty square leagues was devastated by them. In their progress, these animals are preyed upon by the predaceous quadrupeds and birds, by whose incessant attacks their numbers, in ordinary seasons, are kept within bounds.

All these migrations and changes are produced by a different cause from those periodical ones which take place, after certain intervals, or at certain seasons, in various other animals of every grade; and though a scarcity of food, or straitened circumstances or accommodations may be the impelling motives, yet these are produced by an unusual increase in the numbers of the migrating species, so that they are driven to seek an outlet by which their supernumeraries may pass off, and relieve them from the pressure, as in the case of bees; or the whole population, deserting an exhausted country, may establish themselves in better quarters.

SECRETIONAL EMISSIONS IN PERIODS OF DANGER.

This faculty is peculiar to a large variety of animals in a greater or less degree, and is either of an offensive or defensive character, being in no instance employed without some exciting cause. There are in the badger and opossum, as well as in several other carnivorous animals, peculiar glands and bags at the end of the rectum, secreting a yellow substance of a strong and disagreeable smell in its recent state, and which frequently gives to their excrement a kind of musk-like odour. These anal bags are of a spherical form, and have a small round opening just at the margin of the anus. They seem to belong particularly to the carnivorous animals, and may be seen very well in the cat. Their secretion possesses that strong disagreeable odour which characterises so remarkably many animals of this order, as the fox and all the weasel tribe, and which has even made the polecat proverbial in common language, and has bestowed upon it its scientific name, *Mustela putorius*. Some American species exceed the fetor even of the polecat. This is the case with the *Viverra mephitica* and *Coasse* (the skunk and squash). They pour out the fetid matter when pursued, and are thereby effectually defended, as neither man nor animal can approach them.

An acrid fluid exudes through numerous pores of the skin in some reptiles, when they are irritated, as in the salamander and in toads. It is said that the gecko secretes a really venomous fluid between its toes. But

there is a much more dangerous kind of poison formed in some serpents, whose poison-glands are most remarkable. They are situated above the upper jaw, behind and below the eyes; they are surrounded by a very strong muscle, and, in fact, imbedded in it, so that they cannot be seen until the muscle has been divided. They are of some length, and have a laminated texture; internally they have a considerable cavity, and are distinguished from all the other glands by a very long excretory duct, which takes its course along the outer surface of the upper jaw, and opens above and before the poison-teeth in such a manner into the sheath, that the poison flows into the upper opening of the tooth.

The most universal secretion in fish is that of the mucus, which besmears their skin and scales, but the black inky fluid of the cuttle-fish, which has often been supposed to be the bile, is a very singular and peculiar secretion. The bag, in which it is contained, has a fine callous internal surface, and its excretory duct opens near the anus. The fluid itself is thick, but miscible with water to such a degree that a very small quantity will colour a vast bulk of water, and the animal employs it in this way to elude the pursuit of its enemies.

Besides the different secretions of peculiar matters which belong exclusively to single species of insects, as the vapour which some carabi (*Carabus crepitans, marginatus,* &c.) discharge, and the strong odours with which several of the bug kind defend themselves in case of necessity, there is also the poison with which several hymenopterous and apterous insects are armed. The bombardier beetle (*Carabus crepitans*) when touched produces a noise resembling the discharge of a musket in miniature, during which a blue smoke may be seen

to proceed from its extremity. Rolander says that it can give twenty discharges successively. A bladder placed near its posterior extremity, is the arsenal that contains its store. This is its chief defence against its enemies; and the vapour or liquid that proceeds from it is of so pungent a nature, that, if it happens to be discharged into the eyes, it makes them smart as though brandy had been thrown into them. The principal enemy of the bombardier is another insect of the same tribe, but three or four times its size. When pursued and fatigued it has recourse to this stratagem; it lies down in the path of his enemy, who advances with open mouth to seize it; but on the discharge of the artillery, this suddenly draws back, and remains for a while confused, during which the bombardier conceals itself in some neighbouring crevice, but if not lucky enough to find one, the other returns to the attack, takes the insect by the head, and bears it off.

In those insects which possess stings, the irritating or poisonous fluid is formed in a peculiar bag, which sends a duct to the sting. The latter part is hollow, and its tube opens externally. It is contained in a sheath, and barbed at the sides of its point, so that it usually remains in the wound which it inflicts.

The poisonous fluid of an adder is perfectly innocuous when swallowed, but it is clear that there would be danger, were any part of the mouth, the throat, or the œsophagus, in a state of ulceration, or having an abraded surface. The adder in inflicting its blow, generally throws itself, in the first place, into a coil more or less close, and the anterior part of the body is raised. The neck is bent somewhat abruptly backwards, and the head fixed almost horizontally. In an instant the head is, as it were, launched by a sudden effort

towards the object of its anger, and the tooth struck into it, and withdrawn with the velocity of thought. It is found by experiment that the effect of subsequent wounds is greatly diminished, either by the diminution of the quantity of venom, or by some deterioration of its strength; so that if a venomous snake be made repeatedly to inflict wounds, without allowing sufficiently long intervals for it to recover its powers, each successive bite becomes less and less effective. In an experiment to try the effect of the bite of a rattlesnake upon some rats, one of these animals was introduced into the cage with the serpent; it immediately struck the rat, which died in two minutes. Another rat was then placed in the cage; it ran to the part of it farthest from the serpent, uttering cries of distress. The snake did not immediately attack it; but after about half an hour, and on being irritated, it struck the rat, which did not exhibit any symptoms of being poisoned for several minutes, and died at twenty minutes after the bite. A third, and remarkably large rat was then introduced into the cage. It exhibited no signs of terror at its dangerous companion, which, on its part, appeared to take no notice of the rat, and thus they were left for the night; but on the following morning, the snake was found dead, and the muscular part of its back eaten by the rat.

The salamander, as is reported, says Aristotle, extinguishes fire if it goes through it; this is repeated by Pliny, who added, that it extinguishes it like ice. It never appears, he further observes, except in showery weather, and it emits likewise a milky saliva, which is depilatory. Salamanders, says Bosc, emit from their skin a lubricating white fluid when they are annoyed, and if they are put into the fire, it sometimes happens

that this fluid extinguishes it sufficiently to permit their escape; and again, when one touches the terrestrial salamander, it causes it to transude from its skin a white fluid, which it secretes more copiously than its cogeners. This kind of milk is extremely acrid, and produces a very painful sensation upon the tongue. According to Gesner, it is an excellent depilatory. It is sometimes spirted out to the distance of several inches, as Latreille has observed, and diffuses a particularly nauseous scent; it poisons small animals, but does not appear to produce serious effects upon large ones.

The Petrel family have the singular faculty of spouting from their bills, to a considerable distance, a large quantity of pure oil, which they do by way of defence, into the face of any one who attempts to annoy them.

POSTURES, AND USE OF NATURAL WEAPONS.

Many animals keep themselves perfectly motionless, when in danger, and even counterfeit death. The centipede, when touched, twists itself together; and the large hairy caterpillar of the tiger moth rolls itself up, and slips through the fingers of the hand that seizes it. The common rose beetle extends its legs, and assumes altogether the appearance of death; and the pillchafer, on the other hand, contracts its legs, and may be mistaken for a ball of sheep's dung. Other insects let themselves fall among the grass, where they cannot be distinguished from the soil. The death-watch counterfeits death so obstinately, that it allows itself to be mutilated, to be torn limb from limb, to be pierced,

and even roasted, without change of posture. Rudolphi believed that this motionless state arises from a suspension of the animal functions, like fainting; and yet it seems to depend on the animal itself, for it continues in this state as long only as the danger lasts, and saves itself by flight as soon as it is passed, or again relapses should it recur before it is safe.

Among fish, the captured sturgeon remains quiet and passive in the net, while the perch feigns death and floats on its back; the carp thrusts itself into the mud, in order that the net may pass over it, or it makes prodigious springs to clear it, if the bottom be stony.*

Among all the diversified faculties, powers, and organs with which Supreme Wisdom has gifted the members of the animal kingdom, to defend themselves from their enemies, or to secure for themselves a due supply of food, none are more remarkable than those by which they can give an electric shock, and arrest them in their course, whether they are assailants or fugitives. That God should arm certain fishes, in some sense, with the lightning of the clouds, and enable them thus to employ an element so potent and irresistible, as we do gunpowder, to astound, and smite, and stupify, and kill the inhabitants of the water, is one of those wonders of an Almighty arm which no terrestrial animal is gifted to exhibit.*

The fishes hitherto ascertained to possess this power belong to the genera *Tetrodon, Trichiurus, Melapterurus, Gymnotus,* and *Raia.* The most remarkable are the three last, and of them the torpedo is the most celebrated. The wonderful and complex organs with which this fish is furnished, the effect of which has attracted the notice of scientific men for so long a period, were

* Kirby.

doubtless given to these animals by their Creator in lieu of the offensive and defensive arms which enable the rest of their tribe to act the part assigned to them, that they might procure the means of subsistence, and defend themselves when in danger. Almost always concealed in the mud, like most of the *rays*, they can, by this weapon, kill the small fishes that come within the sphere of their action, or benumb the large ones; if they are in danger of attack from any voracious fish, they can disable him by invisible blows, more to be dreaded than the teeth of the shark itself.

The gymnotus, or electric eel, is a still more tremendous assailant, both of the inhabitants of its own element, and even of large quadrupeds, and of man himself, if he puts himself in its way. Its force is said to be *ten* times greater than that of the torpedo. This animal is a native of South America. In the immense plains of the Llanos, in the province of Caraccas, is a city called Calabozo, in the vicinity of which these eels abound in small streams, insomuch that a road formerly much frequented was abandoned on account of them, it being necessary to cross a rivulet in which many mules were annually lost in consequence of their attacks. They are also extremely common in every pond, from the equator to the ninth degree of north latitude.

Humboldt gives a very spirited account of the manner of taking this animal, which is done by compelling twenty or thirty wild horses and mules to take the water. The Indians surround the basin into which they are driven, armed with long canes or harpoons; some mount the trees whose branches hang over the water, all endeavouring, by their cries and instruments, to keep the horses from escaping. For a long time the victory seems doubtful, or to incline to the fishes. The mules,

disabled by the frequency and force of the shocks, disappear under the water; and some horses, in spite of the active vigilance of the Indians, gain the banks, and, overcome by fatigue, and benumbed by the shocks they have encountered, stretch themselves at their length on the ground. There could not, says Humboldt, be a finer subject for a painter: groups of Indians surrounding the basin; the horses, with their hair on end, endeavouring to escape the tempest that has overtaken them; the eels, yellowish and livid, looking like great aquatic serpents, swimming on the surface of the water in pursuit of their enemy.

In a few minutes two horses were already drowned; the eel, more than five feet long, gliding under the belly of the horse or mule, made a discharge of its electric battery on the whole extent, attacking, at the same instant, the heart and the viscera. The animals, stupified by these repeated shocks, fall into a profound lethargy, and deprived of all sense, sink under the water, when the other horses and mules, passing over their bodies, they are soon drowned. The gymnoti, having thus discharged their accumulation of the electric fluid, now become harmless, and are no longer dreaded. Swimming half out of the water, they flee from the horses instead of attacking them; and if they enter it the day after the battle, they are not molested, for these fishes require repose and plenty of food to enable them to accumulate a sufficient supply of their galvanic electricity.

Many birds crouch close and motionless on the ground when a human being approaches them, without making an effort to escape by flight. Thus the quail thrusts its head between the clods of earth, and avoids detection, from its great similarity in colour to the soil,

and in this state, if perceived, it will allow itself to be seized. The goatsucker, as it sits crouched on the branch of a tree, is not to be distinguished from the bark; the ptarmigan and willow-grouse nestle motionless on the surface of the snow, and cannot be readily perceived. The posture assumed by the hoopoe is peculiar; it spreads out its wings, throws its head and beak on its back, and thus secures itself from being recognised. The bittern, living among reeds and sedge, to the withered colour of which it bears a resemblance, stands rooted to its place, with its body perpendicular, and neck contracted, turning rapidly on its heels, as if on a pivot, in whatever direction its enemy approaches; and, if wounded, it throws itself into an attitude to spring, with its head retracted to give greater impetus to the contemplated blow, which is invariably aimed at the eye. The night-heron, on the approach of a man to its haunts, stands stock still, so as to resemble a small post; the snipe, when in danger, crouches flat upon the ground, selecting spots where withered leaves and branches offer no contrast to its colour, and is thus not to be detected by the most keen-sighted fowler, unless betrayed by the piercing brilliancy of its eye. Wrangel relates a somewhat extraordinary tale of the wild geese in Siberia. He says, that when alarmed in the moulting season, and consequently unable to fly, they stretch themselves at length upon the ground, with their heads concealed, so as to feign death and deceive the sportsman. However this may be, there can be no doubt but that the artifices adopted by birds, as a means of defence, and their stratagems to mislead marauders, evince feelings and mental activities analogous to those of other reasonable beings; and it cannot for a moment be denied that they express the alarm and

agitation of their minds, and mean to do so, by their voice and by particular modulations of it.

The squirrel when pursued, flies to the highest tree, climbing up the side interposed to the sportsman, and clings with compressed body to the stem. In the same manner, the wild cat and the fox save themselves by extending themselves suddenly among the fallen leaves, or on a broken trunk in a thicket, till the chase has passed by them. A similar artifice is resorted to by the opossum, and it is recorded that tigers, bruised and wounded by the elephant, have counterfeited death, to avoid further punishment.

In many cases, when animals are not able to conceal themselves entirely, they protect the most sensitive and vulnerable parts of their bodies; thus, the hedgehog, in defending itself with its spines from the attack of another animal, curves its head downwards; and some animals, when struck, roll themselves together, pressing their heads on their breasts, and trying to protect them by covering them with the fore-legs. Dogs, when fighting, endeavour to keep their fore-legs as much under them as possible, to prevent their being bitten. Very few animals appear to adopt useless and unavailing means. It is asserted of the ostrich, though there are great doubts on the subject, that it believes itself safe, when it hides its head in the sand; and Winkell maintains the same of the marten, which conceals its head and shoulders.

Generally, however, animals either take to immediate flight, or put themselves at once into attitudes of defence, either with a view to security, or to fight for the mastery. The strombus, or animal inhabiting the screw shell, defends itself powerfully with its feet against any attack, and has hence been called the

fighter; another species (*Strombus auris Dianæ*) attacks so vigorously with its feet, that it drives others away. *Buccinum levissimum* and others attempt to stick with their sharp proboscis. Other slugs withdraw themselves into their shells; the small grey slug (*Limax agrestis*), in order to descend safely to the ground from the branch of a tree, causes a flow of viscous secretion towards its tail; it forms this into a thread, which it lengthens to the necessity, at the rate of an inch in three minutes. Mussels snap their shells together with such violence, as to retain whatsoever comes within their grasp, and even to dissever the joints of small animals. The Paper Nautilus, or Argonaut, when it means to sail, discharges a quantity of water from its shell, by which means it is rendered lighter than the surrounding medium, and of course rises to the surface; but as soon as a storm arises, or anything gives it disturbance, it retracts its arms, takes in as much water as renders it heavier than that in which it swims, and sinks to the bottom.

Crabs and lobsters have powerful weapons, both offensive and defensive, in their claws. The land-crabs of the Bahamas, when terrified, run back in a confused and disorderly manner, holding up and clattering their nippers with a threatening attitude, and if they are suffered to catch hold of the hand, they will sometimes tear off a piece of the skin. Sea-crabs are naturally quarrelsome, and have serious contests together, by means of their formidable claws, with which they lay hold of their adversary's legs, and wherever they seize, it is not easy to make them forego their hold. The animal seized has, therefore, no alternative but to leave part of the leg behind in token of victory. A crab, when irritated, and made to seize one of its own small

claws with a large one, does not distinguish that it is itself the aggressor, but exerts its strength, and cracks the shell of the small claw. Feeling itself wounded, it casts off the piece in the usual place, but continues to retain the hold with the great claw for a long time afterwards.

Some insects are extremely pugnacious, and even display a spirit of cannibalism towards each other. To make two male crickets fight, the Chinese place them in an earthen bowl, about six or eight inches in diameter. The owner of each tickles his cricket with a feather, which makes them both run round the bowl different ways, frequently meeting and jostling one another as they pass. After several meetings in this way, they at length become exasperated, and fight with great fury, until they literally tear each other limb from limb. Sir J. Smith mentions that a male and female Mantis were put together in a glass vessel, and after a while, the female, which was largest, devoured its companion. Rœsel hatched several, from eggs, in a large glass; and as they grew, they began to attack and devour each other. Though divided into different parcels, the strongest in each community devoured the rest. He compares their battles to that of two hussars, for they guard and cut with the edge of their fore-claws, as the men with sabres; and sometimes at a stroke one cleaves the other through, or severs its head from its chest. It is not possible to read of the wars and duels of the ants, or of the bees, to find them assemble in armies, make evolutions, and fight pitched battles, and to deny them a similarity of mind with those of their superiors, who have soldiers, tactics, and wars.

Several of the tortoise tribe defend themselves stoutly

by biting; and one species (*Aspidonectus ferox*) rears itself on its hind legs and turns upon its assailant. The logger-headed turtle is excessively bold and fierce. When attacked, it defends itself vigorously both with its mouth and paws; and it is extremely difficult to make it quit any hold it happens to take with its jaws: so powerful are these, that the animal is able to divide even very strong substances by means of them. Aldrovandus assures us, that on offering a thick walking-stick to the gripe of one, which he saw publicly exhibited at Bologna, the animal bit it in two in an instant. Among the lizards, are some which not only defend themselves against the smaller animals, but even against serpents and mankind.

The common guana (*Lacerta iguana*), is naturally extremely gentle and harmless. Its appearance, however, is much against it, especially when agitated by fear or anger. Its eyes then seem on fire; it hisses like a serpent, swells out the pouch under its throat, lashes about its long tail, erects the scales on its back, and extending its wide jaws, holds its head, covered over with tubercles, in a menacing attitude. The male, during the spring of the year, exhibits great attachment towards the female. Throwing aside his usual gentleness of character, he defends her even with fury, attacking, with undaunted courage, every animal that seems inclined to injure her; and at this time, though his bite is by no means poisonous, he fastens so firmly, that it is necessary either to kill him, or to beat him with great violence on the nose, in order to make him quit his hold. The green lizard, when driven to extremity, will sometimes defend itself against the attacks of dogs. It springs instantly at the muzzle of the assailant, where it fixes itself so obstinately, that it will

allow itself to be carried off, and even killed, rather than quit its hold. The scorpion, which is but too common about old houses, and in dry or decayed walls, in all hot countries, is extremely bold and watchful. At the approach of an enemy it seldom exhibits any kind of fear, but with its tail erect, and sting in readiness, as if fully confident in the force of its poison, it waits the attack with courage and intrepidity, and seldom desists till either it is killed, or its foe is put to flight.

The feet, the bill, and the wings are the weapons of defence of birds; and among the predaceous tribes they are of immense power and importance. Le Vaillant tells us that he was witness to an engagement between the secretary falcon and a serpent. The battle was obstinate, and conducted with equal address on both sides. But the serpent at length feeling the inferiority of its strength, employed, in its attempt to gain its hole, all the cunning which is attributed to its tribe; while the bird, apparently guessing its design, stopped it on a sudden, and cut off its retreat, by placing himself before it at a single leap. On whatever side the reptile endeavoured to make its escape, its enemy still appeared before it. Then, uniting at once bravery and cunning, it erected itself boldly to intimidate the bird; and, hissing dreadfully, displayed its menacing throat, inflamed eyes, and a head swollen with rage and venom. Sometimes this threatening appearance produced a momentary suspension of hostilities; but the bird soon returned to the charge, and, covering his body with one of his wings as a buckler, struck his enemy with the bony protuberance of the other. He saw it at last stagger and fall; the conqueror then fell upon it to dispatch it, and with one stroke of his bill laid open its skull.

The eyes of the eagle have the glare of those of the lion, and are nearly of the same colour; the claws are of the same shape; the organs of sound are equally powerful, and the cry equally terrible. Destined, both of them, for war and plunder, they are equally fierce, equally bold and untractable. It is impossible to tame them, unless they be caught when in their infancy. It requires much patience and art to train a young eagle to the chase; and, after he has attained to age and strength, his caprices and momentary impulses of passion are sufficient to create suspicion and fears in his master. Authors inform us that the eagle was anciently used in the East for falconry; but this practice is now laid aside: he is too heavy to be carried on the hand without great fatigue, nor is he ever brought to be so tame or so gentle as to remove all suspicions of danger. His bill and claws are crooked and formidable; his figure corresponds with his instinct; his body is robust, his legs and wings are strong, his flesh is hard, his bones are firm, his feathers stiff, his attitude bold and erect, his movements quick, his flight rapid. He rises higher in the air than any of the winged race; and hence he was termed by the ancients the Celestial Bird, and was regarded in their mythology as the messenger of Jupiter. Formed for war, these birds are solitary and unsociable. They are also fierce, but not implacable; and, though not easily tamed, are capable of great docility, and in some cases, especially when gently treated, of inviolable attachment. This, however, happens but rarely, and they resent injuries. A gentleman who lived in the north of Scotland had, a few years since, a tame golden eagle, which the keeper one day injudiciously thought proper, for some petty fault, to lash with a horsewhip. About a week

afterwards the man chanced to stoop within reach of its chain, when the enraged animal, recollecting the late insult, flew in his face with so much fury and violence that he was terribly wounded, but was luckily driven so far back by the blow as to be out of all further danger. The screams of the eagle alarmed the family, who found the poor man lying at some distance in a very bloody plight, equally stunned by the fright and the attack. The bird was still pacing and screaming in a manner not less threatening than majestic. It was even dreaded whether, in so violent a rage, he might not break loose; which, indeed, fortunately perhaps for them, he did just as they withdrew, and escaped for ever.

The black eagle (*Falco melanaetos*), which was in the possession of the Abbé Spallanzani, was so powerful, as without any difficulty, to kill dogs that were much larger than itself. When the Abbé forced one of these animals into the apartment where the eagle was kept, the bird immediately ruffled the feathers on its head and neck, cast a dreadful look at its victim, and, taking a short flight, immediately settled on its back. It held the neck firmly with one foot, by which the dog was prevented from turning his head to bite, and with the other grasped one of his flanks, at the same time driving its talons into the body; and in this attitude it continued, till the dog expired with fruitless cries and efforts.

The courage of the cock is not to be subdued by the most powerful assailants, and his undaunted spirit has rendered him a great favourite in all countries. Nature has provided him with a sharp powerful spur, which it uses with astonishing force and precision in its engagements, but its noble spirit is occasionally shamefully

perverted to the most cruel practices, and its natural weapon made more fatal by artificial means. The cock-pit still remains a reproach to the character of Englishmen.

The greatest rivals of the English in the practice of cock-fighting, are the inhabitants of Sumatra, and of some other parts of the East. They arm one of the legs only, not with a slender gaff as in England, but with a little implement in the form of a scimeter, with which the animals make the most terrible destruction. The Sumatrans fight their cocks for vast sums: a man has been known to stake his wife or children, and a son his mother or sisters, on the issue of a battle. In disputed points four arbitrators are appointed, and if they cannot agree, there is no appeal but to the sword. Some of these people have an idea that their cocks are invulnerable: a father on his death-bed has, under this persuasion, been known to direct his son to lay his whole property on a certain bird, fully persuaded of consequent success.

Cassowaries are sometimes ill tempered and mischievous in confinement, and are much irritated when any person approaches them of a dirty or ragged appearance, or dressed in red clothes, and they frequently attempt to strike at them by kicking forward with one of their feet. One in Paris has been known to leap out of its enclosure, and to tear the legs of a man with its claws.

Swans are very strong, and, at times, remarkably fierce; and have not unfrequently been known to throw down and injure people; and it is stated that an old swan is able to break the leg of a man with a single stroke of its wing. A female, while in the act of sitting, observed a fox swimming towards her from the opposite

shore; she instantly darted into the water, and having kept him at bay for a considerable time with her wings, at last succeeded in drowning him. This circumstance took place at Pensy in Buckinghamshire. An individual of the wild species, caught alive, reared itself up to its greatest height on the approach of a large Newfoundland dog, and struck it so severe a blow with one of its wings, that the dog fled howling.

Ostriches are often fierce towards strangers, whom they will attempt to push down by running furiously at them; and on succeeding in this effort, they not only peck at their fallen foe with their bills, but strike at him with their feet with the utmost violence, the inner claws being exceedingly strong. Dr. Shaw says, he once saw an unfortunate person who had his abdomen entirely ripped up by one of these strokes. While thus engaged, ostriches make a fierce hissing noise, and have their throats inflated and mouths open.

The weapons of the mammalia are the claws or talons, the hoof, the horns, the teeth, and, in some instances, the tail and the spur. The mode of using these weapons is very various, and often terrible. Consider the might that is seated in the proboscis of the elephant; the force with which the rhinoceros, the buffalo, and the ox gore with their horns! Colonel Williamson, in speaking of the rhinoceros, says that it makes wanton attacks on the elephant whenever it has the opportunity; and mentions the circumstance of the latter being found with the belly torn open. An instance is at the same time related, as well known, of a rhinoceros which even rendered the roads impassable by attacking travellers or those who passed near his haunts; and he mentions an attack upon a sporting company, which was made by the same animal in the close of the

year 1788, as generally known to the army and residents of the district:—"Two officers belonging to the troops cantoned at Dunapore, near Patna, went down the river towards Monghyr, to shoot and hunt. They had encamped in the vicinity of Derriapore, and had heard some reports of a gheudah, or rhinoceros, having attacked some travellers many miles off. One morning, just as they were rising about day-break, to go in quest of game, they heard a violent uproar, and, on looking out, found that a rhinoceros was goring their horses, both of which being fastened by their head and heel with ropes, were consequently unable to escape or resist. Their servants took to their heels, and concealed themselves in the neighbouring jow jungles; and the gentlemen had just time to climb up a small tree not far distant, before the furious beast, having completed the destruction of the horses, turned his attention towards their masters. They were barely out of his reach, and by no means exempt from danger, especially as he assumed a threatening appearance, and seemed intent on their downfall. After keeping them in dreadful suspense for some time, and using some efforts to dislodge them, seeing the sun rise, he retreated to his haunt; not, however, without occasionally casting an eye back, as with regret at leaving what he wanted the power to destroy." But even smaller animals are to be dreaded when pushed to extremity. When the gnu antelope is wounded, it turns boldly round on its pursuers; and as long as the chamois sees a chance of escape before it, it flies; but when all avenues are closed, it rushes on the sportsman, in the hope of toppling him over the precipice.

The life of the hamster rat is divided between eating and fighting. It seems to have no other passion than

that of rage, which induces it to attack every animal that comes in its way, without in the least attending to the superior strength of its enemy. Ignorant of the art of saving itself by flight, rather than yield, it will allow itself to be beaten to pieces with a stick. If it seizes a man's hand, it must be killed before it will quit its hold. The magnitude of the horse terrifies it as little as the address of the dog, which last is fond of hunting it. When the hamster perceives a dog at a distance, it begins by emptying its cheek-pouches, if they happen to be filled with grain; it then blows them up so prodigiously, that the size of the head and neck greatly exceed that of the rest of the body. It raises itself on its hind legs, and thus darts upon the enemy. If it catches hold, it never quits it but with the loss of its life; but the dog generally seizes it from behind, and strangles it. This ferocious disposition prevents the hamster from being at peace with any animal whatever. It even makes war against its own species. When two hamsters meet, they never fail to attack each other, and the stronger always devours the weaker. A combat between a male and a female commonly lasts longer than between two males. They begin by pursuing and biting each other, then each of them retires aside, as if to take breath. After a short interval, they renew the combat, and continue to fight till one of them falls. The vanquished uniformly serves for a repast to the conqueror.

A small horned owl, which had been wounded, was kept in confinement till it was somewhat tamed, when it was allowed a certain degree of liberty in a garden where a tame sparrow-hawk was kept, and they never met but a most determined battle ensued. The owl defended itself well, throwing itself on its back, and

awaiting the attack whenever it saw the hawk approaching; and in this position, by biting and scratching, it would almost gain the victory.

A traveller in America saw two snakes, a black snake and a rattlesnake, in the road before him, moving round in a circle, and apparently following each other. This cautious manœuvre was pursued for some time, the circle closing at each round, until, when within a few feet, the black snake was observed to stop, coil, and place itself in an attitude to strike. The rattlesnake then passed round its antagonist several times, lessening the distance at each round, when it also stopped, and began to coil. But before it was ready to strike, the black snake suddenly darted upon it. The evolutions were too rapid to be detected; and when it was again distinctly observed, both snakes were stretched out at full length,—the rattlesnake enveloped in the folds of the black, which had also seized the rattlesnake at the back of the head, and held him there. After a short interval, the black snake gradually unfolded itself, loosened its grip with its mouth from the rattlesnake's head, and moved away. On examination, the rattlesnake was found to be dead, and apparently every bone in its body was crushed.

A stickleback (*Gasterosteus aculeatus*), which was kept in a glass jar, became by degrees so familiar as to take small worms from the hand, and at last grew so bold that, when satiated, or disliking what was offered to it, it would set up its prickles, and strike with its utmost strength at the fingers, if put into the water to it. It would suffer no other fish to live in the same jar, attacking all that were put in, though ten times its own size. One day, by way of experiment, a small fish was put to it, when the stickleback immediately

assaulted and put it to flight, bearing off part of its tail in the conflict; and had they not been separated, it would undoubtedly have killed it.

IMPULSE OF FOOD.

This impulse of food is excited by the cravings of hunger, in itself more ferocious than the animals themselves. Mr. Kirby says, that nothing affords a more striking proof of Creative Wisdom, and of the most wonderful adaptation of means to an end, than the diversities of structure with a view to their particular functions, meaning the different modes by which animals procure their food. If we consider the infinite variety of substances, animal and vegetable, produced from the earth, which form the nutriment of its inhabitants—some solid and not easily penetrable; others, soft and readily severed and comminuted; others, again, fluid or semi-fluid;—we may conceive what a vast diversity of organs is necessary to effect their purpose. To render solid food, of any kind, fit for deglutition and digestion, the same mouth must be furnished with several kinds of teeth: some for incision, others for laceration, others again for grinding and mastication; while those that only absorb liquid merely require an organ adapted for suction, though often, at the same time, fitted to pierce the substance from which the nutritive fluid is to be derived. How various also must be the organs for swallowing, and digesting the food according to its nature; for elaborating it, and abstracting from it all those substances that are required by the several systems at work in the body, and conveying them to their

proper stations; and the means also for rejecting from the body the residuum after the secernment for the above purpose of the finer life-preserving products. Here are a variety of organs, admirable in their structure, and fitted for action in an infinity of ways: some at the bidding of the will, stimulated by the appetite; others independent of the will, such as the distillations, percolations, chemical and electrical processes, constantly going on in the body of every animal, to separate all the products that its nature and functions require: all speak of a *mechanical* agency at work within, not independent in its operation, but fulfilling a law which must be obeyed.

The herbivorous mammalians are generally not remarkable for any artificial means of producing their food. Providence has spread a table before them, and invites them to partake of it, without any other trouble than bending their necks to eat it; but the carnivorous ones—as their destined pabulum is endued with locomotive power, which enables it often to escape from them, and disappoint their expectations,—must have recourse to stratagem, and lie in wait for their prey; these, however, consist chiefly in concealing themselves and in springing suddenly upon it. The fox, of all quadrupeds, is the most celebrated for his stratagems and finesse in entrapping his game; and his patience is equal to his craft. Some have doubted whether this animal can *fascinate* poultry, as has been often asserted; but the following proof seems to confirm it:—A gentleman one night hearing a noise, upon looking out in its direction, saw a fox under the hen-roost, peering up at the hens, and presently saw it running away with one in its mouth, in spite of his shouting.

Birds are l ss noted than even quadrupeds for their

stratagems, or any remarkable means of providing food for themselves or their young. Those of prey boldly attack and seize their destined food wherever they find it; the owls, indeed, like the cats, their analogues, seem to use artifice as much as strength to attract the mice. The carrion feeders, as the vulture and crow, soon discover the carcases of dead animals. Some of the sea birds, especially the gulls, indicate the approach of bad weather, by leaving the coast, and seeking the interior; and during the intense frosts of a severe winter, the web-footed birds and waders, quitting their summer stations in the more northern regions, fly to the south, and seek unfrozen springs and waters of the inland districts, where they find a supply of food. All these physical actions seem to arise from a physical cause, and easily to be accounted for, without having recourse to any other.

With regard to the cold-blooded animals, the fishes and reptiles, we know but little of their habits in this respect, or of any particular stratagems to which they have recourse to procure their food. Some of the predaceous fishes, as the pike and perch, appear to lie in wait in deep water, and so dart upon their prey; others, as the shark, with open mouth pursue and devour it; the fly-catching ones, as the several species of the carp and salmon genus, are equally on the watch, but nearer the surface, to seize a May-fly or ephemera; the fishing-frog hangs out its lines in the sea, to catch other fishes; the serpents are said to fascinate birds; the enormous boa lies in wait for the antelopes and other quadrupeds, and coiling itself round them in mighty folds, crushes them, to render them more fit for deglutition; the Batrachians, Chelonians, and numerous Saurians, are on the alert after insects and small game; while the vast and ferocious crocodiles and alligators,

looking like trunks of trees, lie basking near the surface of the water, ready to spring upon any large fish, or even man, that may chance to come within reach.

Of all animals, insects afford the most numerous instances of instinctive proceedings with this sole end in view; the pit-falls of the ant-lion, the webs and nets of the various sorts of spiders spread over the face of nature, and many more, furnish instances of stratagems to secure their daily food; while an infinity of others acquire it, aided only by their senses and natural weapons. Let any one look at the prominent eyes, tremendous jaws, and legs and wings, formed for rapid motion on the earth or in the air, of tiger-beetles (*Cicindela*), and he will readily see that they want no other aid to enable them to seize their less-gifted prey; and numerous other tribes, both on the earth and in the water, emulate them in these respects. The pacific or herbivorous insects, also, are mostly fitted with an extraordinary acuteness of certain senses to direct them to their appropriate pabulum. The sight of the butterfly and the moth invariably leads them to flowers, to suck whose nectar their multivalve tubes are given them. The scent of the dung-beetles and the carrion-flies allures them to their respective useful, though disgusting, repasts. A very numerous tribe of those that derive their nutriment from other animals, neither entrap them by stratagem, nor assail them by violence; but, as the butterfly and the moth deposit their eggs upon their appropriate vegetable, so do these upon their appropriate animal food. Every bird almost that darts through the air, every beast that walks the earth, every fish that swims in its waters, and almost all the lower animals, and even man himself, the lord of all, are infested in this way.

Smellie remarks that there is hardly a plant that is not rejected as food by some animals, and ardently desired by others. The horse yields the common water-hemlock to the goat, and the cow the long-leaved water-hemlock to the sheep. The goat, again, leaves the aconite, or wolf's-bane, to the horse. The euphorbia, or spurge, so noxious to man, is greedily devoured by some of the insect tribes. The Indian buceros feeds to excess on the colubrina, or nux vomica, used in this country as a poison for rats; and the land-crab on the berries of the hippomane, or manchineel tree. The leaves of the broad-leaved Kalmia are feasted upon by the deer, and the round-horned elk, but are fatally poisonous to sheep, to horned cattle, to horses, and to man. The bee extracts honey without injury from the flowers of this plant, but the man who partakes of that honey, after it has been deposited in the hive-cells, falls a victim to his repast. In the autumn and winter of the year 1790, at Philadelphia, extensive mortality was occasioned among those who had eaten of the honey collected in the neighbourhood of that city, or had feasted on the common American pheasant, or pinnated grouse, as we call it. The attention of the American Government was excited by the general distress; a minute examination into the cause of the mortality ensued; and it was satisfactorily shown that the honey had been chiefly extracted from the flowers of the *Kalmia latifolia,* and that the pheasants which had proved thus poisonous, had fed harmlessly on its leaves. The consequence was, that a public proclamation was issued, prohibiting the use of the pheasant as a food for that season.

Dampier, in his travels, tells us, that when seamen are thrown upon any of the unknown coasts of

America, they never venture upon the fruit of any tree, how tempting soever it may appear, unless they observe that it is marked with the pecking of birds; but fall on it without apprehension where the birds have been there before them. Still, as what is nourishing to birds may be injurious to man, this cannot be always a safe guide.

The following passage from St. Pierre conveys an interesting illustration of the same subject in his own animated style, and concludes with a simple and happy allusion to the working of that power, which is ever performing its wonders in the creation.

"The sluggish cow pastures in the cavity of the valley; the bounding sheep on the declivity of the hill; the scrambling goat browses among the shrubs of the rocks; the hen, with attentive eye, picks up every grain that is lost in the field; the pigeon, on rapid wing, collects a similar tribute from the refuse of the grove; and the frugal bee turns to account even the small dust on the flower; there is no part of the earth where the whole vegetable crop may not be reaped. Those plants which are rejected by one, are a delicacy to the other; and even among the finny tribes contribute to their fatness. The hog devours the horse-tail and henbane; the goat, the thistle and the hemlock. All return in the evening to the habitation of man, with murmurs, with bleatings, with cries of joy, bringing back to him the delicious tribute of innumerable plants, transformed by a process the most inconceivable, into honey, milk, butter, eggs, and cream."

Linnæus states the cow to eat 276 plants, and to refuse 218; the goat eats 449, and declines 126; the sheep takes 387, and rejects 141; the horse likes 262, and avoids 212; but the hog, more nice in its provision

than any of the former, eats but 72 plants, and rejects 171.

The richer a country is in its vegetation, the greater is the number of animals found in it, and the more various their forms. In those tropical lands where the glow of heaven, and the moisture combined, act so powerfully on vegetation; where, according to Humboldt, lofty palms of vigorous growth break through the matted thickets of the Cordilleras, and rear themselves aloft like pillars; where the Cymbidium and fragrant Vanilla embrace the stems of the Anacardias and giant-like fig-trees; slender Bauhinias, arboreous passion-flowers, and yellow-flowering Banisterias encircle the vast trunks of the forest trees, and grasses of infinite length, and tree-like ferns show the colossal powers of nature; where the self-extending Banana tree flourishes, and orchideæ of every hue delight the eye; there is the boundless kingdom of the Faunæ, not as regards number only, but as regards the size, form, nature, and colour of the animals.

Chamisso thus describes the animal world in the Brazils:—

"Although America can boast of nothing which bears resemblance to the gigantic proportions of the animals of the old world, from the elephant to the boa-constrictor, yet ample compensation is made by the infinite number and variety of animals in the Brazils alone. The animal kingdom is in accordance with the vegetable. The very formation of the trees is suggestive of the climbing propensities of the birds, and of the prehensile tails of the mammalia, with which even the predaceous ones are furnished. Every spot teems with life. Armies of crabs inhabit the damp lands in the neighbourhood of the sea, retreating to their holes if

disturbed, and swinging their vast claws over their backs. The greatest abundance, combined with the most gorgeous colours, reigns among the insects, and the butterflies rival the humming-birds in brilliancy. When night sheds its mantle over the earth, the darkness is replaced by thousands of insect fires, which illuminate earth and shrub, and spread a sparkling brilliancy over the sea. The elater bears in its onward flight two continuous streams of light, two lanthorns on its breast; the fire-fly hovers in zig-zag lines through the air with its alternately bright and waning lamp; and amidst the fairy-like scene the air resounds with the bellowing of the frogs, and the clear chirping of the crickets.

The mountains clad with eternal snows, and the polar regions, on the other hand, present few emblems of life. In Africa and Asia exist large tracts of land, which are barren and bare; but on this shifting sea of sand, a mournful silence and a gloomy monotony reign, broken only by a solitary Arab or the occasional rapid passage of the ostrich and the antelope; but no sooner does an oasis, one of those ever verdant islands in the midst of the sandy desert, present itself, than with the re-appearance of vegetation, the traces and abodes of animals are found, and the return to the cheerful world is welcomed by the voice of living and sentient beings.

The use of animal food is by far the most general, as animal substance is more nourishing and more readily digested than vegetable, and hence we find that all graminivorous animals are fed in the early part of their lives with it. The digestive organs of the Carnivori are simpler and less intricate in their construction than of the Graminivori, and in the young of the latter in their early age they are not called into action. Thus

even among insects the young of the fire-fly lives on little snails, while the full-grown insect feeds on plants. In the lowest stages of organised life, particularly in the aquatic varieties, subsistence is universally drawn from animal matter.

Some of the least powerful of animals live as parasites in or upon the bodies of others, and hardly any are entirely exempt. Such as are too weak to seize and slaughter their peculiar prey, seek it in a dead state; and hardly has an animal perished before the carrion feeders begin their attacks. According to Audubon, the Turkey buzzard floats harmlessly over recumbent and sleeping animals in a healthy state, but watches patiently by such as are wounded, perishing in a morass, are ill and dying, until life is extinct, and will not leave them.

Many wait until the process of decomposition has begun, which is a kind of natural preliminary stage of digestion. The carcase which is not devoured by animals and birds, is consumed by armies of insects in so short a time, that Linnæus declared that the blow-flies, with their immediate progeny, will clear the carcase of a horse sooner than a lion; meaning that a blow-fly produces in the course of a few hours an incalculable quantity of maggots, of which each one consumes so much food in the course of one day, and grows so rapidly, that in that one day it increases one hundred-fold its weight. All carrion-feeding animals are therefore benefactors to mankind, as by their ravenous consumption they prevent that mass of corruption from collecting which would soon poison the air. This equally applies to aquatic animals, as not only many fish, but the majority of the Molluscæ and Crustaceæ prey upon dead substances.

The smaller portions of refuse matter, which are, by

perpetual process, dissolved in water, or are swept off the land by the rains into the general mass of waters, furnish food to innumerable little aquatic animals, so that in the whole economy of nature nothing is lost or unserviceable. Even the very elements which escape from decomposition, and float as gases in the atmosphere, are absorbed by the plants, and become again an organic substance. Thus all organic matter is perpetually moving in a course of transformation and change, in which nothing is annihilated, but is made to contribute to the well-being and perfection of the vast scheme of the universe.

The great majority of carnivorous animals, particularly such as are of an active and powerful nature, reject dead substances; and while the vulture, whose beak and claws are comparatively weak, selects such, the mighty and bold eagle will hardly stoop to carrion in its fiercest hunger; and, indeed, so marked is the preference, and so decided the selection for living prey, that in many cases it is perfectly safe while motionless, and is only seized when it betrays its vitality by a change of position. Thus the frog sits intently watching an insect as long as it is quiet, and only seizes it when it moves. The green-tree frog is thus preserved in confinement during the winter, when no living insects are to be procured, by gently moving little pieces of meat or dead flies in front of it. The falcon will only stoop on living birds, and if they be thrust into its cage, he will not touch them as long as they remain motionless.

The amount of food required by animals is various; in general, the herbivorous and aquatic races consume the most. Among the latter, the shark, the pike, and the crocodile are the most voracious. Water birds,

also, are more insatiable than those of the land; and it is said of the stormy petrel, that, having satiated itself with food, it disgorges the contents of its stomach, and crams itself afresh.

All animals which find within their immediate reach a sufficiency of food eat more than others. The shrew-mouse and the mole, which prey on insects, spiders, and worms, are capable of consuming their own weight in food in the space of twenty-four hours.

The craving for food, with respect to time, varies very considerably; and we find that herbivorous animals can only endure fasting for a very short period, while the carnivorous can exist without food for even weeks. The horse and the ruminating animals are enfeebled by hunger after two or three days, and sink at the expiration of a week; the wolf and other predaceous beasts can, on the contrary, support hunger for a lengthened period without the least exhaustion. A cat which belonged to a vessel from the port of Mistley, in Essex, was missing when the vessel sailed from some harbour in America, and no one knew what had become of it; but on arriving in a port of the Channel, where it was necessary to unfurl a sail that had not been used till then during the voyage, the cat was discovered, in a sadly emaciated state, in the folds of the sail, and still alive. In the Sappho, from Nova Scotia to Biddeford, the cat belonging to the vessel was found in the middle of the cargo. She had been a prisoner for twenty-nine days, and, of course, had nothing to subsist on during that time; she was still alive, but almost a skeleton. The Baltic Trader, from St. Petersburg to Leith, with a cargo of flax, on being unloaded, a cat was found in one of the bundles, and much compressed within it, but still alive, though the vessel had

been thirty-eight days on its passage. Caterpillars, crickets, and grass-hoppers perish very quickly if deprived of food, while the ant-lion can fast for a half-year after its last meal. Spiders can fast for months, while the parasitical tick perishes immediately it is removed from the body on which it fed.

The effects of hunger present strong contrasts: herbivorous animals experience listlessness, exhaustion and dejection; in the carnivorous, courage and bodily powers are increased, and they become so much more daring and fierce that they lose sight of all precautions and care for their safety, and pay no regard to the numbers and strength of their adversaries.

Migration, to a considerable extent, is caused by the necessity of seeking food. As soon as vegetation is at a stand from the effects of winter, and even earlier if it has been influenced by the weather, or from any so great increase to their numbers that the neighbouring country no longer yields sufficient food, the various animals wander forth in groups or in great bodies to more favourable spots, followed equally by those beasts which prey upon them. In Europe this is remarkably the case as regards the lemmings, which inhabit the mountains of Norway and Sweden, particularly the Sewo range, where they multiply to so prodigious an extent that their burrows almost touch one another. Their emigrations take place at uncertain intervals, but, according to Linnæus, about once in every ten years, when they go forth in such immense multitudes, that Olaus Wormius, and other old writers, believed they descended from the clouds. They travel in a direct and undeviating line from the north to the south west, and allow no obstacle to interrupt their course. If they are disturbed or pursued

while swimming over a lake, and their phalanx is separated by oars or poles, they will not recede, but keep swimming directly on, and soon get into regular order again. They have sometimes been known even to board or pass over a vessel. This army of rats moves chiefly by night, or early in the morning; and makes such destruction among the herbage, that the surface of the ground over which they have passed, appears as if it had been burned. The multitudes that are sometimes found dead on the banks of rivers or other places, corrupt, by their stench, the whole atmosphere round, and thus produce many diseases. They are even thought to infect the plants which they gnaw, for cattle, turned into pastures where they have been, are said frequently to die in consequence. They never enter dwellings of any description to do mischief, but always keep in the open air. Foxes, bears, martins, and other animals follow on their track, and consume them by myriads.

Among birds the wonderful flights of the passenger pigeon, as described by Audubon, are actuated by the same impulse of food. Driven by necessity, they change their situations in search of acorns, mast, and berries, and where they alight, the ground is quickly cleared of all esculent fruits.

As the means of subsistence decreases at the approach of the inclement season, many animals seek their retreats, and fall into a state of torpor, and in most instances existence is supported by the absorption of the fat, and other secretions, and hence these animals which were plump and in good condition before their hybernation, come forth in a weak and emaciated state. Some lay up provisions, but this precautionary economy is not confined to hybernation only. The satiated spider

secures its new captives in its web; and the shrike spits beetles on thorns as a reserve for a future meal. Owls, ravens, magpies, and nuthatches hide their superfluous food; the wolf, the fox, the lynx, and the wild dog bury portions of their food against the next calls of hunger, but where provisions exist in abundance no economy is practised. The ape covetous of, and appropriating every thing, not only lays by no store, in consequence of the abundance of food with which it is surrounded, but throws away the food it is eating to possess itself of the next object which attracts it.

The collection of winter provisions forms part of the economy of many insects, as is the case with bees and ants, but it occurs more frequently among the mammalia. The squirrel lays up a provision of nuts and acorns, which are seldom found in its nest, but in the hollows of the tree, carefully laid up together, and where it is never touched by the animal but in cases of necessity, when no food is to be had abroad. Thus a tree serves both for a retreat and a storehouse; and without leaving it during the winter, the squirrel possesses all those enjoyments that its nature is capable of receiving. The beaver wanders abroad for food as long as the weather permits, and never touches its store till all nature is bound in ice. The hamster rat provides a magazine of pulse and grain, which it carries home in the extraordinary pouches in its cheeks, with which they are furnished; and although what these creatures lay up is not for their winter's support, (since during that season they always sleep,) but for their nourishment previously to the commencement, and after the conclusion of their torpid state, yet the enormous amount of one hundred pounds' weight of grain has been taken from a burrow. The economic rats, which

live in pairs, construct burrows with the utmost skill, immediately below the surface of a soft turfy soil. They form a low chamber, of a flattish arched form, about a foot in diameter, to which they sometimes add as many as thirty small passages or entrances. Near the chamber they often construct other caverns, in which they lodge their winter stores. These consist of plants, which they gather in summer, harvest and bring home; and even at times they bring them out of their cells, to give them a more thorough drying in the sun. The Kamschatdales have a kind of superstitious veneration for these little creatures, and whenever they find any of them thrown upon the banks of rivers, weak and exhausted during their migrations, they render them every assistance. They never destroy their hoards, though they sometimes take away part of their store; but in return they invariably leave either some caviar or other food, to support them in its stead. The labours of the marmot, as described by M. Beauplan, are another remarkable instance of the impulse of collecting food. The most extraordinary feature in the whole of these arrangements is the calculation which the animals must form of the quantity of food they must provide, and the knowledge they must possess of the length of time for which it will be required. It cannot be from experience, because the young exercise the same providence.

All animals, without exception, reject, with the most unerring discrimination, all food of an injurious and deleterious character, which instinct many travellers have turned to account. Le Vaillant placed the utmost reliance on his monkey, and had no hesitation in using the unknown roots and fruits which he fell in with on his journey, if it did not reject them. Douville took

with him on his African expedition two monkeys, as tasters, and found that such fruits as they threw from them with a loud scream were of a poisonous nature. Grant relates a similar circumstance.

Some animals are known to eat substances altogether opposed to their habits and natures; and as in the case of the dog, which eats grass medicinally, and with violence to itself, as proved by the nausea it suffers, it is a remarkable instinct which prompts the measure, and leads it to seek relief from matter so diametrically at variance with its proper food. It is less easy to account for the action in other animals; for although voracity may lead the shark to swallow everything that falls in its way, whether digestible or not, of which a singular instance is given in one that was caught by the "Alceste," in whose stomach was found the basket, shavings, cordage, ducks, hens, and a buffalo's hide, which had been thrown overboard in the course of the day; yet why an elephant should seize and swallow a lady's reticule, or an ostrich a bunch of keys, does not admit of so easy a solution.

The nature of food has a great influence, not only on the bodies but also on the temperament and mental properties of animals. The nature and variety of the demands for food, the difficulty or facility in procuring the same, the precautions taken in its acquirement under circumstances of the utmost risk, the struggles for mastery and the desperate conflicts with their prey, stamp whole families with a peculiar and typical character. Those animals whose food is always within their reach, are in general indolent and peaceful, and possess but little mental activity; and such are the herbivores, with few exceptions. But, on the other hand, the carnivores are extremely prompt and lively; their bones

are more compact, their muscles stronger, their faculties keener, and their sense of perception greater; and hence their sensations are more intense and more easily excited, their actions quick and resolute, hesitating at neither plunder nor destruction.

Predaceous habits prevail in every class of the animal kingdom, from the Infusoria up to the Mammalia; and many of them, like the *Crustaceæ* and spiders, feed on the blood and juices of living animals, catching them either by a spring, by pursuit, by lying in wait, or by snares.* The insects that frequent the waters, require predaceous animals to keep them within due limits, as well as those that inhabit the earth; and the water-spider (*Argyroneta aquatica*) is one of the most remarkable upon whom that office is devolved. To this end, her instinct instructs her to fabricate a kind of diving-bell in the bosom of that element. She usually selects still waters for this purpose. Her house is an oval cocoon, filled with air, and lined with silk, from which threads issue in every direction, and are fastened to the surrounding plants. In this cocoon, which is open below, she watches for her prey, and even appears to pass the winter, when she closes the opening. It is most commonly, yet not always, under water; but its inhabitant has filled it for her respiration, which enables her to live in it. She conveys the air to it in the following manner: she usually swims on her back, when her abdomen is enveloped in a bubble of air, and appears like a globe of quicksilver. With this she enters her cocoon, and displacing an equal mass of water, again ascends for a second lading, till she has sufficiently filled her house with it, so as to expel all the water. How these little animals can envelope their

* Kirby.

abdomen with an air-bubble, and retain it till they enter their cells, is still one of Nature's mysteries that has not been explained. It is a wonderful provision, which enables an animal that breathes the atmospheric air, to fill her house with it under water, and by some secret art to clothe her body with air, as with a garment, which she can put off when it answers her purpose. This is a kind of attraction and repulsion that mocks all inquiries.

Amongst the spiders called the *hunters* and the *vagrants*, some seize their prey like the lion or the tiger, with the aid of few or no toils, by jumping upon them when they come within reach. There is a very common black-and-white spider amongst the latter, which may be always seen in summer, on sunny rails, window-sills, &c. When one of these spiders, which are always upon the watch, spies a fly or a gnat at a distance, he approaches softly, step by step, and seems to measure the interval that separates him from it with his eye; and if he judges that he is within reach, first fixing a thread to the spot on which he is stationed, by means of his fore-feet, which are much longer and larger than the others, he darts upon his victim with such rapidity, and so true an aim, that he seldom misses it. Whether his station is vertical or horizontal, is of little consequence; he can leap equally well from either, and in all directions. He is prevented from falling by the thread just mentioned, which acts as a kind of anchor, and enables him to recover his station, when without such a help he would be, as it were, driven out to sea.

Insects live on the greatest possible variety of substance, drawing their nourishment, as larvæ, from dung or decomposed matter, fruits, flowers, the water, mould, and other things; and in their perfect state the

difference of their tastes is not less abundant. Many of the *Diptera* prey on blood or on the juice of plants, and are as troublesome to mankind by their stings as they are injurious to plants by their devastation. A peculiar species of musquito (*Culex reptans*), common in parts of Lapland and Siberia, but particularly so in the Banat, is feared both by man and beast. Its usual habitat is the low, damp, and bushy shores of the Danube. On its appearance, the cattle fly hastily from their pasture, and the peasants drive off the beasts of labour to place them in security from the dreaded tyrants. They attack chiefly the tender and bare parts of the body; and the cattle, driven mad by the torment, plunge into the water to rid themselves of them, but they perish from inflammation, from cramp, and even from strangulation if the insect has succeeded in reaching the trachæa. Those which survive the attacks are a long time in recovering from the effects, and even man is not exempt. Every precaution is taken to guard against them, by washing the coats of the animals with lotions, and by keeping them in smoke, which the animals themselves seek the cover of. The extraordinary effects produced upon cattle, on the appearance of these flies, leaves no doubt that the pain inflicted is excruciating; and the consternation is far greater than that produced by the breeze-fly (*Œstrus bovis*), so graphically described by Virgil: Georg. lib. iii.—146:—

> "Est lucos Silari circa, ilicibusque virentem
> Plurimus Alburnum volitans, cui nomen Asilo
> Romanum est, Œstrum Graii vertere vocantes;
> Asper, acerba sonans; quo tota exterrita sylvis
> Diffugiunt armenta; furit mugitibus æther
> Concussus, sylvæque et sicci ripa Tanagri."

Other insects besides spiders employ a system of

architecture as a means of procuring food; and it is not a little remarkable that *larvæ* of insects construct these contrivances to ensnare the perfect ones. The lion-worm (*Leptis*) is a curious and voracious little creature, having a tapering form; the head being more pointed than the tail. Its instincts are very similar to those of the ant-lion; for, like that formidable insect, it makes a species of cavity in the loose earth, and there waits in ambuscade for its prey. A portion of its body lies concealed under the sand, the rest stretches across the bottom of the den, and appears so stiff and motionless, that, at first sight, it might be taken for a bit of straw, half an inch in length. If, however, any insect, in search of food, should happen to walk into the cave of the lion-worm, the little morsel of stubble in an instant becomes all animation, falls like a serpent on its prey, and, winding its body in coils around its victim, compresses it to death, and sucks out the juices by means of a couple of hooks fixed to its head. When a strong insect happens to be thus captured, it might fly away with the lion-worm if nature had not furnished the latter with means of fixing itself, suitable to the emergency. It bends a part of its body into the shape of a hook; this is then thrust under the sand, and serves as an anchor to hold the insect, while the upper part of the body remains at liberty to master and devour the prey. If such prey, eluding its serpent-like grasp, should begin to make its way up the sides of the den, the cunning hunter resorts to the very same expedient as the ant-lion. By means of its head it sends forth a shower of sand, with such marvellous agility and precision of aim, that it rarely fails to bring the battered game once more within the reach of its formidable pincers. This *Leptis* ultimately turns into a species of fly.

The devices of the ant-lion are still more extraordinary if possible. He forms, with astonishing labour and perseverance, a pit in the shape of a funnel, in a dry sandy soil, under some old wall or other spot protected from the wind. His pit being finished, he buries himself among the sand at the bottom, leaving only his horns visible, and thus waits patiently for his prey. When an ant or any other small insect happens to walk over the edge of the hollow, it forces down some of the particles of sand, which gives the ant-lion notice of its presence. He immediately throws up the sand which covers his head, to overwhelm the ant, and, with its returning force, bring it to the bottom. This he continues to do till the insect is overcome and falls between his horns. Every endeavour to escape, when once the incautious ant has stepped within the verge of the pit, is vain; for, in all its attempts to climb the side, the deceptious sand slips from under its feet, and every struggle precipitates it still lower. When within reach, its enemy plunges the points of his jaws into its body, and having sucked out all its juices, throws out the empty skin to some distance. This insect in its perfect state, when it somewhat resembles a dragon-fly, is but seldom found; it is, however, sometimes to be met with in sandy places and near rivulets. It is marked in Dr. Turton's translation of the "Systema Naturæ," as a native of this country, but there is no record of its having been discovered within the island.

Among the fish there are some which procure their food in the most peculiar manner. The devices of the frog-fish have been mentioned in another place. The chætodon rostratus, which frequents the shores and mouths of rivers in India, feeds principally on flies and other small winged insects that hover over the waters.

When it sees a fly at a distance on any of the plants in the shallow water, it approaches very slowly, and with the utmost caution, coming as much as possible perpendicularly under the object. Then, putting its body in an oblique direction, with the mouth and eyes near the surface, it remains for a moment immoveable. Having fixed its eyes directly on the insect, it shoots at it a drop of water from its tubular snout, but without showing its mouth above the surface, from whence only the drop seems to rise. This is done with so much dexterity, that though at the distance of four, five, or six feet, it seldom fails to bring the fly into the water.

The voracity of the shark is so great, that it is a fortunate circumstance for those who would avoid its attacks, that its mouth is so situated under its head, that it has to throw itself on one side in order to seize its prey; for its velocity in the water is so immense that nothing of which it was once in pursuit would otherwise be able to escape it. The white shark has six rows of teeth, hard, sharply-pointed, and of a wedge-like figure; and these, when the animal is at rest, lie quite flat in his mouth; but when the prey is to be seized, they are instantly erected by a set of muscles that join them to the jaw. They constantly attend ships in the tropics in expectation of what may drop over-board; and if, in this case, any of the men have that misfortune, they must inevitably perish. Persons while swimming are constantly seized and devoured by them. The late Sir Brooke Watson was, some years ago, swimming at a little distance from a ship, when he saw a shark making towards him. Struck with terror at its approach, he immediately cried out for assistance. A rope was instantly thrown, and even when the men were in the act of

drawing him up the ship's side, the monster darted after him, and, at a single snap, tore off his leg.

"Increasing still the terrors of the storms,
His jaws horrific arm'd with three-fold fate,
Here dwells the direful shark. Lured by the scent
Of steaming crowds, of rank disease, and death,
Behold! he rushing cuts the briny flood,
Swift as the gale can bear the ship along;
And from the partners of that cruel trade,
Which spoils unhappy Guinea of her sons,
Demands his share of prey, demands themselves.
The stormy fates descend, one death involves
Tyrants and slaves; when straight, their mangled limbs
Crushing at once, he dyes the purple seas
With gore, and riots in the vengeful meal."

* If we consider the vast tendency to increase in the oceanic tribes, that where a terrestrial animal gives birth to a single individual, a marine one perhaps produces a million (the cod-fish alone, according to Leeuwenhoek and Lacepede, produces more than nine millions of eggs in a year), and that if neither man, nor shark, nor other predaceous fish, made them their food, they would so fill the ocean in congenial climes, that there would scarcely be space for the motions of life, we see the reasons why such enormous numbers were created that could swallow them by hundreds, why their yawning mouth and throat were planted with teeth and fangs of different descriptions, fixed and moveable, arranged in many a fearful row of bristling points, and why this tremendous array has been mustered in the mouth of animals of such never sated voracity, and of such unmitigated cruelty and ferocity. Another function of these tremendous animals is to devour all *carcases,* which, from whatever cause, are floating on the water: thus they act the same part

* Kirby.

in disinfecting and purifying the ocean, that hyenas and vultures, their terrestrial analogues, and other animals do upon earth.

Doubtless the infinite class of animals which inhabit the waters—and of which, probably, we may still be unacquainted with a very large proportion—all bear the same relation to each other, and are organised with a view to a similar action upon each other, that we see takes place upon the earth. There are predaceous fishes to keep the aquatic population of every description within due limits; there are others whose office it is to remove nuisances arising from putrescent substances, whether animal or vegetable; and, lastly, there are others which, like our herds and flocks, are peaceful and gregarious, and graze the herbage of sea-weeds that cover the bed of the ocean.

Lizards remain principally motionless, following their prey with their eyes till it comes within reach, when they seize it with a sudden spring. Frogs and toads and the cameleon dart out their long prehensile tongues, and secure their insect prey with such unerring certainty and rapidity that the eye can scarcely follow the motion. Snakes kill their victims either by biting them or by crushing them in their folds. The boa constrictor embraces cattle, and even beasts of prey, in its folds, and, having thus destroyed them, it lubricates them with its saliva and gorges them entire. It is fortunate for mankind that their rapacity is often their own punishment; for whenever they are thus gorged they become torpid, and may be approached and destroyed with safety. Patient of hunger to a surprising degree, whenever they seize and swallow their prey, they seem, like surfeited gluttons, unwieldy, stupid, helpless, and sleepy. They at that

time seek for some safe retreat, where they may lurk for several days together, and digest their meal in safety. The smallest effort then will destroy them; they can scarcely make any resistance; and, equally unqualified for flight or opposition, even the naked Indians do not fear to assail them. But it is otherwise when this sleeping interval of digestion is over; they then issue, with famished appetites, from their retreats, while every animal of the forest flies from their presence. In the island of Java, we are assured that one of these animals has been known to kill and devour a buffalo; and an eye-witness thus describes the scene and the previous combat:—One of these serpents, of enormous size, had for some time been waiting near the brink of a pool, in expectation of its prey, when a buffalo was the first animal that appeared. Having darted upon the affrighted beast, it instantly began to wrap him round with its voluminous twistings, and at every twist the bones of the buffalo were heard to crack almost as loud as the report of a pistol. It was in vain that the animal struggled and bellowed: its enormous enemy entwined it so closely that at length all its bones were crushed to pieces, like those of a malefactor on the wheel, and the whole body was reduced to one uniform mass; the serpent then untwined its folds in order to swallow it at leisure. To prepare for this, and also to make it slip down the throat more smoothly, it was seen to lick the whole body over, and thus to cover it with a mucilaginous substance. It then began to swallow it at the end that afforded the least resistance; and in the act, the throat suffered so great a dilatation, that it extended to thrice its own thickness. Another circumstance, where a human being was the victim, occurred in the island of Celebes. One of the crew of

a Malay prow went on shore in quest of betel-nuts in the woods, and on his return lay down, it was supposed, to sleep on the beach. In the course of the night he was heard by his comrades to scream out for assistance. They immediately went on shore, but it was too late; for an immense snake of this species had crushed him to death. Its attention being entirely occupied by its prey, the people went boldly up to it and cut off its head. The snake had seized the unfortunate man by the wrist, where the marks of the fangs were very distinct, and the mangled corpse bore evident signs of having been crushed by the monster's twisting itself round it. The length of this snake was thirty feet, and its thickness equal to that of a moderate-sized man.

None of the higher classes of animals vary so much in their food as birds. They eat much and often, the consequence of their active, restless lives, and of the rapid circulation of their secretions; they drink little, but the granivorous the most. Having no teeth they either discuss their food with their bills or gulp it down entire, even if it be an animal. Among those which feed on fish, the cormorant drops perpendicularly down, from its highest flight, on the object of pursuit, and diving after it with the rapidity of a dart, and with an almost unerring certainty, seizes its victim; then emerging, with the fish across its bill, with a kind of twirl, it throws it into the air, and dexterously catching it head foremost, swallows it whole. The gannets, also, during their fishing, rise high into the air, and sail aloft over the shoals of herrings and pilchards, much after the manner of kites. When they observe the shoal crowded thick together, they close their wings to their sides, and precipitate themselves, head foremost, into the water, dropping almost like a stone. Their eye in

this act is so correct, that they never fail to rise with a fish in their mouths. To take these birds, the inhabitants of St. Kilda tie a herring to a board and set it afloat; so that by falling furiously upon it, the bird may break its neck in the attempt. Some years ago at Penzance, one of these birds saw some pilchards lying on a fir plank, in a place for curing these fishes, and darted down with so much violence, as to strike its bill quite through an inch and quarter plank, and to kill itself on the spot. There is, in fresh waters, scarcely a fish, however large, that the heron will not strike at and wound, though unable to carry it off; but the smaller fry are his chief subsistence; these, pursued by their larger fellows of the deep, are compelled to take refuge in shallow waters, where they find the heron, a still more formidable enemy. His method is to wade as far as he can into the water, and there patiently and motionless to await the approach of his prey; into which, when it comes within his sight, he darts his bill with inevitable aim. Though he usually takes his prey by wading into the water, he frequently also catches it while on the wing, but this is only in shallow waters, where he is able to dart with more certainty than in the deeps, when rising with a fish struggling in his bill, he flies to the shore, and gives it no time to expire, but swallows it whole, and returns again to his fishing. The pelican in fishing does not immediately swallow its prey, but fills its pouch, and returns to the shore to devour it at leisure.

Some birds prey on the remains of food left by others, and some even dispute the right of possession with man. A person shooting in Hampshire, sprung a pheasant in a wheat stubble, and shot at it, when, notwithstanding the report of the gun, it was pursued

by a hen harrier, but escaped into a covert. He then sprung a second, and a third, and these likewise got away; the hawk hovering round him all the time he was beating the field, as if conscious of the game that lurked in the stubble, and determined to appropriate it. Mr. Bruce says that "upon the highest top of the mountain Lamalmon, not far from Gondar, while my servants were refreshing themselves after the toilsome ascent, and eating their dinner in the open air, with several large dishes of boiled goat's flesh before them, a bearded-eagle, or Lämmer-Geyer suddenly appeared; he did not stoop rapidly from a height, but came flying slowly along the ground, and sat down close to the meat, within the ring the men had made round it. A great shout, or rather cry of distress, called me to the place. I saw the eagle stand for a minute, as if to recollect himself; while the servants ran for their lances and shields. I walked up as nearly to him as I had time to do. His attention was fully fixed on the flesh. I saw him put his foot into the pan, where there was a large piece in water, prepared for boiling; but finding the smart which he had not expected, he withdrew it, and forsook the piece that he held. There were two large pieces, a leg and a shoulder, lying upon a wooden platter; into these he thrust both his claws, and carried them off; but I thought he still looked wistfully at the large piece which remained in the water. Away he went slowly over the ground, as he had come. The face of the cliff over which criminals are thrown, took him from our sight. The Mahommedans that drove the asses, were much alarmed, and assured me of his return, and it was not many minutes before he came," &c. Some birds again, though abundantly competent to procure a subsistence on their

own account and by their own exertions, compel others to disgorge and abandon their prey, which they themselves then devour. Audubon, with his usual graphic power, thus describes a scene. "During spring and summer, the white-headed eagle, to procure sustenance, follows a different course, and one much less suited to a bird apparently so well able to supply itself without interfering with other plunderers. No sooner does the fish-hawk make its appearance along the Atlantic shore, or ascend the numerous and large rivers, than the eagle follows it, and, like a selfish oppressor, robs it of the hard-earned fruits of its labour. Perched on some tall summit, in view of the ocean, or of some water course, he watches every motion of the osprey while on the wing. When the latter rises from the water, with a fish in its grasp, forth rushes the eagle in pursuit. He mounts above the fish-hawk, and threatens it by actions well understood, when the latter, fearing perhaps, that its life is in danger, drops its prey. In an instant, the eagle, accurately estimating the rapid descent of the fish, closes its wings, follows it with the swiftness of thought, and the next moment grasps it. The prize is carried off in silence to the woods, and assists in feeding the ever hungry brood of the eagle." The predatory gulls are singularly bold and active, fishing occasionally on their own account, but not unfrequently subsisting on the food swallowed by some of the terns and smaller species of the gulls, which after a determined and harassing pursuit, they compel them to disgorge on the wing, seizing it before it reaches the water. Hardly any birds of its size are secure from the attacks of the Arctic gull; for when stimulated by hunger, it hesitates not to assault them, to compel them to disgorge

their food. That singular instinct, which seems to condemn it to depend for its chief supply of food on the superior industry or dexterity of other birds, irresistibly impels it to follow the main body of those caterers for its subsistence, in their great periodical migrations.

The carnivorous beasts secure their prey either by open attack and encounter; or they hunt it down, like the wolf and the jackall; or they lie in wait for it, like the Felinæ. Among these latter, after the cat, perhaps the leopard and panther are the most remarkable for the perseverance and patience with which they watch for their prey. They lurk in ambush, amongst bushes or verdure, on the borders of forests, and spring with a sudden and tremendous leap on such animals as pass by. So prompt, so rapid, and so well timed are their movements, that few escape. Their thirst for blood is insatiable. The puma, or South American lion, resembles the cat in its mode of seizing its prey: it approaches by drawing itself along on its belly, it glides softly through the shrubs and bushes, conceals itself in ditches, or, if it shows itself, assumes a mild and fawning appearance, and, watching the favourable opportunity of seizing the animal which it has marked for its victim, at one leap fastens itself on its back, seizes it with its left paw and teeth in such a manner as to render it impossible for it to escape, while with the right paw in a few minutes it tears it to pieces. It then sucks the blood, devours a part of the flesh, and carries the carcase into the nearest wood, to devour it at leisure. The chetah, or hunting leopard, is frequently tamed in India, and used in the chase of antelopes. It is carried in a kind of small waggon, chained and hooded, lest, on approaching the herd, it should be too precipitate, or not make choice of a proper animal. When first unchained, it does not

immediately spring towards its prey, but winds with the utmost caution along the ground, stopping at intervals, and carefully concealing itself till a favourable opportunity offers: it then darts on the herd with astonishing swiftness, and overtakes them by the rapidity of its bounds. If, however, in its first attempt, which consists of five or six amazing leaps, it does not succeed, it loses breath, and, giving up the point at once, returns sulkily to its cart. The description of a chase, by one who has enjoyed the sport, will give the best idea of the manner in which it is conducted:—

"Just before we reached our ground, the Shuter Suwars (camel courier), who always moved on our flanks in search of game, reported a herd of antelopes about half a mile out of the line of march, and the chetahs being at hand, we went in pursuit of them. The leopards are each accommodated with a flat-topped cart, without sides, drawn by two bullocks, and each animal has two attendants. They are loosely bound by a collar and rope to the back of the vehicle, and are also held by the keeper by a strap round the loins. A leathern hood covers the eyes. The antelopes being exceedingly timid and wild, the best way to enjoy the sport is to sit on the cart alongside the driver; for the vehicle being built like the hackeries of the peasants, to the sight of which the deer are accustomed, it is not difficult, by skilful management, to approach within two hundred yards of the game. On this occasion we had three chetahs in the field, and we proceeded towards the spot where the herd had been seen; in a line, with an interval of a hundred yards between each cart. On emerging from a cotton field, we came in sight of four antelopes, and my driver managed to get within a hundred yards of them ere they took alarm.

The chetah was quickly unhooded and loosed from his bonds, and as soon as he viewed the deer, he dropped quietly off the cart, on the opposite side to that on which they stood, and approached them at a slow crouching canter, masking himself by every bush and inequality which lay in his way. As soon, however, as they began to show alarm, he quickened his pace, and was in the midst of them in a few bounds. He singled out a doe, and ran it close for about two hundred yards, when he reached it with a blow of his paw, rolled it over, and in an instant was sucking the life's blood from its throat. One of the other chetahs was slipped at the same time, but after making four or five desperate bounds, by which he nearly reached his prey, suddenly gave up the pursuit, and came growling sulkily back to his cart. As soon as the deer is pulled down, a keeper runs up, hoods the chetah, cuts the victim's throat, and securing some of the blood in a wooden ladle, thrusts it under the leopard's nose. The antelope is then dragged away, and placed in a receptacle under the hackery, while the chetah is rewarded with a leg for his pains."

When not pressed by the severe calls of hunger, the lion feeds chiefly at dawn and twilight, and is easily disturbed; he is, nevertheless, abroad during the whole night, and prowling round the herds of wild animals, or near the flocks of the settlers, or caravans of travellers, watches an opportunity, and, seizing upon some straggler, carries it to his place of repose, and devours it at leisure. But impelled by the cravings of hunger, which the scarcity of wild animals, and the care of the colonists sometimes force him to endure, he becomes a very different animal: his cunning becomes daring, no barrier will withstand him—he rushes with

resistless fury upon the object of his attack—a bullock is torn from the team, or a horse from the shafts—and even a man is dragged from the watch fires, surrounded by his comrades and powerful fire-arms. Perseverance in watching, and in retaining his prey when seized, are other characteristics of the lion. An instance of the latter is related in the journal of the Landdrost Jah. Sterneberg, kept in his journey to the Namaqua Hottentots, and mentioned in Phillips's Researches in South Africa:—"The waggons and cattle had been put up for the night, when, about midnight, they got into complete confusion. About thirty paces from the tents stood a lion, which, on seeing us walked very deliberately about thirty paces farther behind a small thorn bush, carrying something with him which I took to be a young ox. We fired more than sixty shots at the bush. The south-east wind blew strong, the sky was clear, and the moon shone very bright, so that we could perceive anything at a short distance. After the cattle had been quieted again, and I had looked over everything, I missed the sentry from before the tent. We called as loudly as possible, but in vain; nobody answered, from which I concluded he was carried off. Three or four men then advanced very cautiously to the bush, which stood right opposite the door of the tent, to see if they could discover anything of the man, but returned helter skelter; for the lion, which was still there, rose up, and began to roar. About a hundred shots were again fired into the bush, without perceiving anything of the lion. This induced one of the men again to approach it with a firebrand in his hand; but as soon as he approached the bush, the lion roared terribly, and leaped at him, on which he threw the firebrand at him, and the other people having fired

about ten shots at him, he returned immediately to his former station. The firebrand which had been thrown at the lion, had fallen into the midst of the bush, and, favoured by the wind, it began to burn with a great flame, so that we could distinctly see into it, and through it. We continued our firing into it; the night passed away, and the day began to break, which animated every one to fire at the lion, because he could not lie there without exposing himself entirely. Seven men, posted at the farthest waggons, watched to take aim at him as he came out. At last, before it became quite light, he walked up the hill with the man in his mouth, when about forty shots were fired without hitting him. He persevered in retaining the prey amidst the fire and shot, and carried it securely off, but he was followed, and eventually killed over the remains of the unfortunate sentinel."

The fox hunts its prey down, as before mentioned, yet occasionally it employs its cunning, and lays in wait.

The following instance is related in "St. John's Wild Sports:"—

"When living in Ross-shire, I went out one morning in July, before daybreak, to endeavour to shoot a stag, which had been complained of very much by an adjoining farmer, as having done great damage to his crops. Just after it was daylight I saw a large fox coming quietly along the edge of the plantation in which I was concealed; he looked with great care over the turf wall into the field, and seemed to long very much to get hold of some hares that were feeding in it, but apparently knew that he had no chance of catching one by dint of running; after considering a short time he seemed to have formed his plans, and having

examined the different gaps in the wall, by which the hares might be supposed to go in and out, he fixed upon the one that seemed the most frequented, and laid himself down close to it in an attitude like a cat watching a mouse-hole. Cunning as he was, he was too intent on his own hunting to be aware that I was within twenty yards of him with a loaded rifle, and able to watch every movement he made. I was much amazed to see the fellow so completely out-witted, and kept my rifle ready to shoot him if he found me out and attempted to escape. In the meantime I watched all his plans; he first, with great silence and care, scraped a small hollow in the ground, throwing up the sand as a kind of screen between his hiding-place and the hare's mews; every now and then, however, he stopped to listen, and sometimes to take a most cautious peep into the field; when he had done this he laid himself down in a convenient posture for springing upon his prey, and remained perfectly motionless, with the exception of an occasional reconnoitre of the feeding hares. When the sun began to rise, they came one by one from the field to the cover of the plantation; three had already come in without passing by his ambush: one of them came within twenty yards of him, but he made no movement beyond crouching still more flatly to the ground; presently two came directly towards him; though he did not venture to look up, I saw by an involuntary motion of his ears that those quick organs had already warned him of their approach; the two hares came through the gap together, and the fox, springing with the quickness of lightning, caught one and killed her immediately; he then lifted up his booty and was carrying it off like a retriever, when my rifle-ball stopped his course by

passing through his back-bone, and I went up and dispatched him."

When we consider the arrangements for destruction, and the fierce and murderous instincts with which animals, particularly the feline ones, are endowed, we may be at a loss to comprehend what place they hold in the plans and economy of nature; but on looking a little farther we shall perceive that the races of herbivorous animals, without a natural check, would soon become too numerous for the substances which have been allotted for their nourishment, and, by creating famine, would be the cause of their own destruction. Instances of such a sweep upon the vegetation of a country have in reality occurred. A recent traveller in South Africa thus writes of the migrations of the Trek-boken or Migratory Springboks:* "It is scarcely possible for a person passing over some of the extensive tracts of the interior, and admiring that elegant animal, the Springbok, thinly scattered over the plains, and bounding in playful innocence, to figure to himself that these ornaments of the desert can often become as destructive as the locusts themselves. The incredible numbers which sometimes pour in from the north, during the protracted droughts, distress the farmers inconceivably. Any attempt at numerical computation would be vain; and by trying to come near the truth, the writer would subject himself, in the eyes of those who have no knowledge of the country, to a suspicion that he was availing himself of a traveller's assumed privilege; yet it is well known in the interior, that on the approach of the Trek-boken, the grazier makes up his mind to look for pasturage for his flocks elsewhere,

* The same writer computes the number of Springboks in the Karroo Plains, seen within a compass of fifty miles, to be at least 100,000.

and considers himself entirely dispossessed of his lands until heavy rains fall. Every attempt to save the cultivated fields, if they be not enclosed by high and thick hedges, proves abortive. Heaps of dry manure, (the fuel of the Sneeuwbergen and other parts) are placed close to each other round the fields and set on fire in the evening, so as to cause a dense smoke, by which it is hoped the antelopes will be deterred from their inroads; but the dawn of day exposes the inefficiency of the precaution by showing the lands, which appeared proud of their promising verdure the evening before, covered with thousands, and bared level with the ground."

CARE OF ANIMALS FOR THEIR YOUNG.

All the proceedings of animals with regard to their young seem to result from an excitement analogous to that which Dr. Jenner first noticed in the swallow, upon which he observes—"The economy of the animal seems to be regulated by some *external* impulse which leads to a train of consequences," and which does not cease its action till it has accomplished the end for which it was given, namely, the procreation; oviposition preceded by nidification; incubation; hatching, or birth, nutrition, and education of the young progeny of each individual kind, according to the general law of the Creator. This impulse is particularly prominent in the females, and is the more powerful in cases where the number of offspring is limited, where the mental capacities are of a more exalted order, and where the newly-born require the greatest care and attendance. It is a prevailing instinct with all animals to seek out

the most appropriate and retired spot in which to deposit their young or their eggs; and many for that purpose leave their proper element and have recourse to another, as the turtle seeks the shore and the gnat the water. * Of all the instincts of the feathered part of the creation, there is none more remarkable, more varied, and more worthy of admiration than that which directs them in the situation and structure of their nests. One nidificates upon the ground; another under it, or in the sand; some select the chimney or eaves of houses for their clay-built structures; those gelatinous nests, which the Chinese epicures so highly prize, are formed in caverns and dark places by the little bird whose work they are. The great majority, however, select trees and bushes; and where they are within reach, their nests are carefully concealed. The mammalia retire to the most sequestered spots, and separate themselves entirely from all intercourse with their kind, and conceal their young with the utmost jealousy. We know very little of the proceedings of the remaining classes of vertebrates, which are distinguished by having cold blood—the reptiles, namely, and the fishes—except that they do not feel that instinctive love for their young, after birth, exhibited by the quadrupeds and birds. They, however, invariably select a proper place in which to deposit their eggs, where they can be hatched either by artificial or solar heat. Those of some *Ophidians*, as snakes, are buried in sand, and, not seldom, even in fermenting heaps of manure. The *Saurians* also select a proper place for their eggs, and then desert them; the crocodile buries hers in the sands near rivers, where many, however, are devoured by the ichneumon and other enemies.

* Kirby.

In the *Batrachian* order one species of salamander commits a single egg to a leaf of the Persicaria, which it protects by carefully doubling the leaf, and then, proceeding to another, repeats the same manœuvre. The toads and frogs lay their eggs in the water, the former producing two long strings, resembling necklaces, formed, as it were, of beads of jet enclosed in crystal; while those of the latter consist of irregular masses of similar beads. This gelatinous or transparent envelope forms the first nutriment of the embryo. The turtle will swim one hundred leagues to deposit its eggs on some favoured shore; and, according to Humboldt, the marsh tortoises frequent the banks of the Orinoko by thousands, in order to bury their eggs.

Insects deposit their eggs in spots where they will be safely hatched, and where the young will find food before them; and, as it is against the economy of nature that the females should otherwise provide for them, even if they themselves did not perish immediately after having performed their functions, they lay their eggs, which are to be hatched in the course of the same season, in sheltered spots, protected from the heat of the sun; and such as are to come forth in the ensuing spring they deposit in artistically prepared cells, or attach them to some object, covering them with down from their own bodies, as the brown-tail and golden-tail moths, or casing them with a kind of varnish. One water-beetle, the *Hydrophilus piceus*, constructs a little canoe of reeds which it cements together, and having deposited its eggs therein closes it up. Many prepare a provision of food for the future larvæ, as the mason-wasp, which thrusts into each cell containing an egg several small caterpillars, and then closes the orifice. Others lay their eggs on the

substance which is the proper food of the future larvæ, as the blow-fly on carrion, and the horse breeze-fly on the skin of the horse, selecting such parts as the animal can reach with his tongue, to which the little maggot adheres, and is thus conveyed with the food to the stomach. The sand-flea, or Chigoe of Surinam, fixes itself on the legs and hands, and buries itself beneath the skin and the flesh where it feeds, and in process of time forms a small nest or bladder in which are deposited thousands of eggs or nits, which producing young Chigoes, are of so dangerous a consequence that amputation has been found necessary to save life. The ichneumon fly either agglutinates its eggs upon caterpillars, or penetrates their bodies, and deposits its eggs in the inside, and the larvæ when hatched suck the nutritious juices of the creatures without attacking their vitals, so that they are still enabled to transform themselves into chrysalids, in which state they perish, while the ichneumon issues from the case. The pill-chafer provides a proper nidus for its eggs, by forming round pellets of dung, in the middle of each of which it deposits an egg. The burying sylph buries small birds and animals, not merely for food, but as a receptacle for its eggs, and to nourish the young family of grubs that proceed from them: this process of interment seems necessary for the continuation of the species, since otherwise foxes, ravens, kites, and other carnivorous animals would seize on the bodies, and along with them would swallow the grubs of the beetles, and thus the whole species might be under the risk of extirpation.

Such insects, whose lives are prolonged after having laid the foundation of a future progeny, carry their attentions somewhat farther in providing for them.

A second species of mason-wasp does not at once inclose in its nest all the sustenance which its larva will require before transformation, but imprisons a living caterpillar from time to time, and when that is consumed opens the nest and introduces another.

All spiders inclose their eggs in a web, and many of them in a cocoon. The vagrant species makes a small bag of whitish silk, which it drags everywhere with it; this is particularly the case with a variety called the wolf, (*Lycosa saccata*), by Dr. Lister, which, according to Swammerdam, "in order to hatch her eggs the better, carries them about, as it were, in a case, with wonderful solicitude and affection; insomuch, that when the skin forming this case, which hangs to the hinder part of her body, is by any accident broken off, the little insect seeks after it with as much earnestness and industry as a hen for her lost chickens, and when found fastens it again to its place with the greatest marks of joy." If deprived of it, she makes the most strenuous efforts for its recovery, and if restored, her actions demonstrate her delight. She seizes it, and with the utmost agility, runs off with it to a place of security. Bonnet, to put her affection to the test, threw one into the hole of a large ant-lion. He seized her bag; she struggled till it loosened from her tail; she then regained it with her jaws, but his superior strength pulled it into the sand, and she chose to be dragged in with it rather than forsake it. Bonnet forced her from it, but she would not leave the spot, and chose rather to be buried alive with her eggs. When the proper time comes, she makes an opening in the bag for the young to come forth, when they run in clusters upon her back and legs, she carrying them

about with her, and feeding them till they are able to keep themselves.

The earwig appears to hatch her eggs with the maternal assiduity of the hen, and to allow no opposing interposition to frustrate her intentions. In the month of June M. Geer found, under a stone, a female earwig, accompanied by many little insects, which appeared to be her own young. They continued close to her, and often placed themselves under her belly, as chickens do under a hen. At another time, in April, he found a female earwig under some stones, placed over a heap of eggs, of which she took great care; never forsaking them. He placed them in a box half filled with earth, and dispersed the eggs up and down it; but she soon carried them, in her jaws, one after another, into one place, and remained constantly on the heap, without quitting it for a moment, as if sitting to hatch them. In the middle of May the young ones appeared.

Fishes are not altogether indifferent to the fate of their brood; the shark and the skate deposit their young in thin horny cases; some fish leave the depths of the ocean and deposit their spawn in the shallows, where the young fry are comparatively safe from the voracity of their numerous enemies; others, again, like the salmon, prepare a proper receptacle for their spawn, which is thus described: "A pair of these fish are seen to make a furrow, by working up the gravel with their noses, rather against the stream, as a salmon cannot work with his head down stream, for the water then going into his gills the wrong way, drowns him. When the furrow is made, the male and female retire to a little distance, one to the one side and the other to the other side of the furrow: they then throw

themselves on their sides, again come together, and rubbing against each other, both shed their spawn into the furrow at the same time. This process is not completed at once; it requires from eight to twelve days for them to lay all their spawn, and when they have done so they betake themselves to the pools to recruit themselves. Three pairs have been seen on the spawning bed at one time, and were closely watched while making the furrow and laying their spawn."* The pipe-fish (*Syngnathus acus*) is provided with a peculiar pouch, and M. Risso, who speaks of the great attachment of these fish to their young, thinks that the pouch probably serves as a place of shelter to which the young ones retreat in case of danger. He says that he has been assured by fishermen, that if the young were shaken out of the pouch into the water over the side of the boat, they will not swim away, but when the parent fish is held in the water in a favourable position, the young will again enter the pouch.

Among the Ranæ, the Pipa, or Surinam Toad affords a very singular deviation from the usual course of nature in the production of its offspring. Mr. Ferman, who has described this animal, declares himself to have been an eye-witness to the procedure. The eggs are generated by the female, who, when they have attained the proper degree of maturity, drops them on the ground. The male amasses together the heap, and deposits them with great care on the back of the female, which contains certain cavities, opening outwards, and somewhat resembling the cells of a bee-hive, which at that period are open for their reception, and which afterwards close upon them. The ova remain in the cellules until the second birth, which takes place in

* Ellis on the Natural History of the Salmon.

somewhat less than three months, when the young ones emerge from the back of the parent completely formed. During the time of concealment they undergo the usual change of the rest of the genus, into the tadpole state, which they entirely put off before their final extrusion.

The Lizard tribe, including the crocodiles, beyond the preparation of a kind of nest, and the concealment of their eggs, either by covering them with sand or grass, occupy themselves with no care for their young; but snakes, that is the viviparous ones, continue their attention for some time. It is a fact satisfactorily ascertained, that the young of the common viper, for some time after their birth, retreat, when suddenly alarmed, into the mouth of the female, in the same manner as the young of the opossum do into the abdominal pouch of their parent; and it has been well attested that the young of the rattle-snake adopt the same mode. M. de Beauvais declares that he was an eye-witness to the procedure. He saw a large rattle-snake, which he had disturbed in his walks; it immediately coiled itself up, opened its jaws, and in an instant five small ones that were lying by it rushed into its mouth. He retired in order to watch the snake, and in a quarter of an hour saw her again discharge them. He then approached a second time, when the young ones rushed into its mouth more quickly than before, and the animal moved off. According to the observations of Valenciennes, the female of a gigantic snake, the *Python bivittatus,* broods over its eggs. In the Garden of Plants in Paris, where two of these animals were kept, the female, in May 1841, laid fifteen eggs, and coiling herself over them maintained her position without touching food, and only occasionally drinking, for the space of fifty-six days, when seven

young ones were hatched. Some experiments were made to test the temperature of the eggs, which from being 75° at the commencement, increased to 100° at the end of the period.

The attachment of birds to their young is not excelled by that of any other creatures; their whole existence is absorbed in their duties, and their whole natures undergo a change. The female generally sits the most, and in some instances altogether, when she is supplied with food by the male; but when that does not occur, as in the case of the domestic poultry and other gallinaceous birds, she snatches a hasty meal once during the day and returns immediately to her nest. In the generality of cases, however, the male relieves the female in her task, and shares with her in the labour of feeding the young. Among the gallinaceous tribes, the turkey, both wild and domesticated, lays its eggs in some retired and obscure place; for the cock, enraged at the loss of his mate, while she is employed in hatching, is apt otherwise to break them. The tame birds sit on their eggs with so much perseverance, that, if not taken away, they will almost perish with hunger before they will entirely leave the nest. In the wild state several turkey hens sometimes associate, perhaps for mutual safety, deposit their eggs in the same nest, and rear their broods together. M. Audubon once found three females sitting on forty-two eggs. In such cases the nest is constantly guarded by one of the parties, so that no crow, raven, nor even polecat dares approach it, and the mother will not forsake it while life remains.

The boldness and courage with which birds, even the most inoffensive, defend their young is truly astonishing, particularly when it is considered that by their act they incur the risk of the destruction they would avert

from their young. Even the little humming-bird does not hesitate to attack the bird of prey which approaches its nest. The wild duck engages in fierce conflict with the plundering raven, and the Skua-gull defends its offspring with the fierceness of an eagle. When the inhabitants of the Fero islands visit its nest, it attacks them with such force that if they hold a knife perpendicularly over their heads the gull will sometimes transfix itself in its fall on the plunderers.

Some birds employ artifice in warding off danger from their young. The arts used by the lapwing to allure boys and dogs from the neighbourhood of her young are extremely amusing. She does not wait their arrival at the nest, but boldly pushes out to meet them. When as near as she dares venture, she rises from the ground with a loud screaming voice, as if just flushed from hatching, though probably not within one hundred yards of her nest. She now flies with great clamour and apparent anxiety, whining and screaming round the invaders, striking at them with her wings, or fluttering and flying heavily as if wounded, but if near she appears altogether unconcerned, and her cries cease in proportion as her fears are augmented.

> "Hence round the head
> Of wond'ring swains, the white-wing'd Plover wheels
> Her sounding flight; and then directly on,
> In long excursion, skims the level lawn,
> To tempt them from her nest."

The affection of partridges for their young is peculiarly interesting. Both the parents lead them out to feed: they point out to them the proper places for food, and assist them in finding it. They frequently sit close together, covering the young ones with their wings; and from this situation they are not easily roused. If,

however, they are disturbed, the male gives the first signal of alarm, by a peculiar cry of distress, throwing himself at the same moment more immediately into the way of danger, in order to mislead the enemy. He flutters along the ground, hanging his wings, and exhibiting every symptom of debility. By this stratagem he seldom fails of attracting the attention of the intruder so far, as to allow the female to conduct the helpless brood into a place of safety. Mr. White says that a partridge came out of a ditch, and ran along shivering with its wings, and crying out as if wounded, and unable to get away. While it feigned this distress, a boy who attended him saw the brood, which was small and unable to fly, run for shelter into an old fox's hole under a bank. Mr. Markwick also relates that "as he was once hunting with a young pointer, the dog ran on a brood of very small partridges. The old bird cried, fluttered, and ran tumbling along just before the dog's nose, till she had drawn him to a considerable distance, when she took wing and flew further off, but not out of the field. On this the dog returned nearly to the place where the young ones lay concealed in the grass; which the old bird no sooner perceived than she flew back again, settled just before the dog's nose, and a second time acted the same part, rolling and tumbling about till she drew off his attention from her brood, and thus succeeded in preserving them." This gentleman also says, that when a kite was once hovering over a covey of young partridges, he saw the old birds fly up at the enemy, screaming and fighting with all their might to preserve their brood.

Most animals prepare a secure retreat in which they bring forth their young, where they remain as long as they are helpless, and to which they often retreat when

threatened with danger; others take extraordinary pains for their concealment; and all exhibit the most tender and devoted attachment to their offspring. The natural affection of the whale is extremely interesting. The cub being insensible to danger is easily harpooned, when the attachment of the mother is so manifested as to bring it almost certainly within the reach of the whalers. Hence, though a cub is of little value, yet it is often struck as a snare for the mother. In this case she joins it at the surface whenever it has occasion to rise for respiration, encourages it to swim off, and seldom deserts it while life remains. She is then dangerous to approach, but affords frequent opportunities of attack. She loses all regard for her own safety, in anxiety for the preservation of her young, dashes through the midst of her enemies, despises the danger that threatens her, and even voluntarily remains with her offspring after various attacks on herself.*

The female Walrus, says Captain Cook, will defend the young one to the very last, and at the expense of her own life, whether in the water or on the ice; nor will the young one quit the dam, though she be dead; so that if you kill one, you are sure of the other. The following incident occurred in his third voyage, when the Resolution and Discovery were returning from Behring's Straits:—"In the afternoon we hoisted out the boats, and sent them in pursuit of the sea-horses that surrounded us. Our people were more successful than they had been before, returning with three large ones, and a young one. The gentlemen who went on this party were witnesses of several remarkable instances of parental affection in these animals. On the approach of our boats towards the ice, they all took their cubs

* See page 154.

under their fins, and endeavoured to escape with them into the sea. Several whose young were killed and wounded, and were left floating on the surface, rose again and carried them down, sometimes just as our people were going to take them into the boat; and they might be traced bearing them to a great distance through the water, which was coloured with their blood. We afterwards observed them up at times above the surface, as if for air, and again diving under it, with a dreadful bellowing. The female, in particular, whose young had been destroyed and taken into the boat, became so enraged that she attacked the cutter, and stuck her tusks through the bottom of it."

Among the Ruminants, the motherly affection shows itself in the strongest colours in the chamois, deer, and roes. The two latter allow themselves to be hunted instead of their young, and the roe darts upon the dog that attacks its fawn, and tramples it till it desists. Rengger relates a conflict between a cow and a jaguar, in defence of her calf, and which she continued even after her muzzle had been torn away. Bears and wild swine fight for their young to the last extremity. The bat, when it flies abroad, carries its offspring with it. The care and tenderness of monkeys to their young, in a completely wild state, is very conspicuous. They hold them under a proper obedience and restraint; and D'Osbonville has seen them suckle and cleanse them, and afterwards, crouching on their hams, delight to see them play with each other. They would wrestle, throw or chase one another; and if any of them were malicious in their antics, the dams would spring upon them, and seizing them with one paw by the tail, correct them severely with the other. Some would try to escape, but, when out of danger, approached in a

wheedling, caressing manner, though ever liable to relapse into the same faults; in other cases, each would come at the first cry of the dam. If they removed to a little distance, the young would follow gently; but when there was any necessity for going fast, they always mounted on the backs of the females.

The tigress produces four or five young ones at a litter. She is at all times furious, but her rage rises to the utmost extremity when robbed of her offspring. She then braves every danger, and pursues her plunderers, who are often obliged to release one of their captives, in order to retard her motion. She stops, takes it up, and carries it to the nearest covert, but instantly returns and renews her pursuit, even to the gates of buildings or the edge of the sea; and when her hope of recovering her offspring is lost, she expresses her agony by howlings so hideous as to excite terror wherever they are heard. The wild rabbit, previous to her littering, if she does not find a hole suited to her purpose, digs one, at the bottom of which she makes a warm and comfortable bed for her offspring with the hair she pulls from her own body. During the whole of the first two days she never leaves them, except when pressed by hunger, and then she eats with surprising quickness and immediately returns. She always conceals them from the male, lest he should devour them; and therefore, when she goes out, she covers up the hole so carefully, and rolls over it to flatten its surface, that its place is not perceptible to the eye. In this manner she continues her attention for about a month, when the young ones are able to provide for themselves. Notwithstanding the unaccountable propensity which the male has to devour them when very young, yet, when they are brought by the mother to the mouth of the hole, to eat

such herbs as she gets for them, he seems to know them, takes them between his paws, smoothes their hair, and caresses them with great tenderness.

Dr. Goldsmith relates a remarkable instance of parental affection in a fox, which occurred near Chelmsford. A female fox, that had, as it should seem, but one cub, was unkennelled by some hounds, and hotly pursued. The poor animal, braving every danger rather than leave her cub behind to be worried by the dogs, took it up in her mouth, and ran with it in this manner for some miles. At last, taking her way through a farm-yard, she was assaulted by a mastiff, and compelled to drop her cub, which was taken up by the farmer. The animal escaped. Another fox was hunted near St. Ives, during three quarters of an hour, with a cub, about a fortnight old, all the time in her mouth, which she was at length compelled to leave to the ferocity of her pursuers.

This affection for the young is, in numerous instances, extended by one animal to those of another, as well to those of a hostile race as to those which are the general objects of its prey. Thus a cat has been known to rear a young rat and hare, and a dog a cub fox. It is a common occurrence to rear ducklings under hens, which, as far as the deception in the eggs is concerned, is not remarkable; but that the στοργη or affection should be continued to creatures of different habits, and which habits are a source of perpetual disquietude to her, is very extraordinary, and admits of no natural explanation; since, unlike the mammalia, she has no superabundance of nourishment to be relieved of in turning foster mother to an adopted race.

The cares of the parents are not, in many instances, limited to the mere duties of protection and nourish-

ment, but, before they cast their young off, they instruct them in the means of obtaining food for themselves, and in the general habits of their nature. The feline races having caught their prey, teach their young to destroy it, to tear it, and to revel in its blood, and their analogue, the eagle, goes one step farther in teaching the power of flight. Sir H. Davy had an opportunity of watching their proceedings. He says:—"I once saw a very interesting sight above one of the crags of Ben Nevis, as I was going, on the 20th of August, in the pursuit of black game. Two parent eagles were teaching their offspring, two young birds, the manœuvres of flight. They began by rising from the top of a mountain in the eye of the sun; it was about mid-day, and bright for this climate. They at first made small circles, and the young birds imitated them; they paused on their wings, waiting till they had made their first flight, and then took a second and larger gyration, always rising towards the sun, and enlarging the circle of flight, so as to make a gradually extending spiral. The young ones still slowly followed, apparently flying better as they mounted; and they continued this sublime kind of exercise, always rising, till they became mere points in the air and the young ones were lost, and afterwards their parents, to our aching sight."

Notwithstanding that natural love in brutes is much more violent and intense than in rational creatures, Providence has taken care that it should be no longer troublesome than it is useful to the young; for so soon as the wants of the latter cease, the mother withdraws her fondness, and leaves them to provide for themselves; and what is a very remarkable circumstance in this part of instinct, we find that the love of the parent

may be lengthened out beyond the usual time, if the preservation of the species requires it; as we may see in birds that drive away their young as soon as they are able to get their livelihood, but continue to feed them if they are tied to the nest, or confined within a cage, or appear by any other means, to be out of a condition of supplying their own necessaries.

Scoresby, in his "Account of the Arctic Regions," says:—"Bears, though they have been known to eat one another, are remarkably affectionate to their young. The female, which has generally two at a birth, defends them with such zeal, and watches over them with such anxiety, that she sometimes falls a sacrifice to her maternal attachment. A pleasing and very extraordinary instance of sagacity in a mother bear was related to me by a credible and well-informed person, who accompanied me in several voyages to the Whale fishery, in the capacity of surgeon. This bear, with two cubs under its protection, was pursued across a field of ice, by a party of armed sailors. At first she seemed to urge the young ones to an increase of speed, by running before them, turning round, and manifesting, by a peculiar action and voice, her anxiety for their progress; but finding her pursuers gaining upon them, she carried, or pushed, or pitched them alternately forward, until she effected their escape. In throwing them before her, the little creatures are said to have placed themselves across her path, to receive the impulse; and, when projected some yards in advance, they ran onwards until she overtook them, when they alternately adjusted themselves for a second throw."

It has been observed on the N. W. coast of America, that when a female otter is attacked in company with

her young one, she clasps it with her fore-feet, and plunges beneath the surface; but as the cub cannot remain long under water, she is forced to rise again very soon. If the hunters can come on the female by surprise, and separate her from her young one, the cub is taken immediately; but the mother no sooner hears its cries, than she swims to the boat from whence they proceed, and regardless of all danger, shares the fate of her little complaining captive.

An instance of the affection of a weasel for its offspring is related by a person, who, while standing in a footpath close to a hedge side, observed something coming towards him, but till it got close to him he could not be certain what it was; at last he perceived that it was a weasel with one of her young ones in her mouth. The animal was so intent on her burthen that she did not see the man till he kicked her, when she dropt her young one, and retreated into the bottom of the hedge. The man then stood over the helpless young one with a large stick in his hand, not with the intention of harming the old one (as he was not a keeper), but merely to see how the parent would proceed. She soon peeped out of her covert, and then made several feints to get her charge, but was obliged to run into the hedge again, apparently intimidated at the stick which he flourished and knocked about. At last she summoned up all her resolution for one grand effort; and in spite of the opposition of the man, she, after a great deal of dodging to avoid the stick, which he used in every way to keep her off without hurting her, fairly succeeded in obtaining the object of her solicitude, and bore it off in triumph from between his legs.

A rat was seen to approach the place where a hen

was brooding her chickens, as it appeared, to take a share of some grain with which they had been fed; when the hen attacked it. The rat stood on the defensive, and fought for five minutes, but was killed by its antagonist. The hen was severely bitten in the engagement, but recovered.

The *cimex griseus* inhabits the birch tree. The family of this field-bug consists of thirty or forty young ones, which she conducts as a hen does her chickens. She never leaves them; and as soon as she begins to move, all the little ones closely follow, and whenever she stops, assemble in a cluster round her. De Geer having cut a branch of birch, with one of these families on it, the mother showed every symptom of uneasiness; instead of immediate flight, she never stirred from her young, but kept beating her wings incessantly with a very rapid motion, evidently for the purpose of protecting them from danger.

AFFECTION OF OFFSPRING.

The consideration of the different degrees of care that descend from the parent to the young, so far as it is absolutely necessary for the leaving a posterity, is very astonishing; and it is not less wonderful to observe that the love of the parent should be so violent while it lasts, and that it should last no longer than is actually necessary for the preservation of the young. This natural love is not observed in animals to ascend from the young to the parent, as not being necessary for the continuance of the species; nor indeed in reasonable creatures does it rise in any proportion, as it spreads

itself downwards; for in all family affection, we find protection granted and favours bestowed, are greater motives to love and tenderness, than safety, benefits, or life received.

The affection of young animals to their parents is only temporary, and does not extend beyond the period when they are able to provide for themselves; and it varies in its duration according to the time necessary for attaining that end. Its intensity seems to subside simultaneously both in parent and offspring, and after the period of its total cessation, not a vestige even of recognition remains. During its continuance, it concentrates within itself every other feeling, so as in fact to be the only one that influences the young animal. The lamb, if separated from the ewe, is loud in its complaints, and when released, flies directly to the voice which responds to its own, distinguishing it even in the midst of a crowded flock. In cases where it has been requisite to place the lamb under a foster mother, it has been found necessary to put the skin of its own mother on another ewe for a short time, so that, deceived by the smell, it by degrees attaches itself to its new parent. That the smell is one of the means by which ewe and lamb recognise each other, no one who has watched a flock of sheep can doubt, particularly when, after shearing, the outward appearance of the ewe has undergone such a change, that no other sense could effect the object. The young of monkeys and of all the deer tribe remain with their dams after they are killed, and are easily captured, and the same with the cubs of whales and seals.

SOCIAL IMPULSE.

THE social system appears in its first crude form as a result of organisation, when many animals are united in forming one body, as the Volvox among the Infusoria, the sea-pen (*pennatula*) and corals among zoophytes, &c. Ehrenberg, in speaking of the Volvoces, says:—"The careful and attentive naturalist recognises a social impulse in these creatures, which originates from a disposition to unite their powers towards one common end, a condition requiring a degree of intelligence which can hardly be sufficiently estimated, from their minuteness. But it must not be forgotten, that each individual creature, however small, possesses organs of sensation equivalent to eyes, and that, consequently, it does not move about blindly in the water, but as a denizen of an insignificant portion, as we may consider it, of our vast world, shares with us the enjoyments of a sensitive existence, however humiliating the fact may be to our pride."

The voluntary union, the formation of families or of larger societies, is often independent of impulse in animals, as they remain in a social state from having found themselves together, by having been brought into existence in one spot.

The social system may be divided into two classes, the partial and the perfect; the first being only temporary, and dependent upon seasons and circumstances, and the latter lasting and indissoluble, with the whole community united and working for one common end. To the first belongs the assemblage of animals for their

periodical migrations, as the Reindeer, Lemmings, and others of the Rodentia; the land-crabs, and the vast shoals of fish that appear at regular intervals along the coasts; and to the second, the association of many, and in some cases, of thousands, of individuals in one republic, occupying one habitation, and combining their labour for one common good. These latter are chiefly confined to the insect race, familiar to every one as regards the ants and the bees, but however familiar, still their economy and their constitution are an inexhaustible study. Kirby says, there is a circumstance requiring notice which is almost peculiar to the gregarious Hymenoptera, dwelling in a common habitation; in all their communities, besides one or more prolific females and males, there is an order of sterile females, which are solely employed in labour and pursuits beneficial to the community at large to which they belong, especially the care and nurture of the young.

The wisdom and beneficial effects of this law, by which the Creator has regulated their communities, and prescribed to all their duties and functions, must be evident to every one. It sets free the majority of the community to give their whole attention to those labours upon which the welfare and existence of their several associations depend. Indeed, if they were all to be prolific, their societies would soon be dissolved, or destroyed by the evils attendant upon an overburdened population; or their increase would be so rapid, that the whole earth would soon be covered by them, to the great annoyance, if not destruction, of the rest of its inhabitants.

It is in the habits of those insects which live in societies, that we perceive the most extraordinary

demonstration of even intelligent intellect; for what other terms can be justly applied to that faculty within them, which leads or enables them to form political communities, with established governments, sovereignties, social ranks, and appropriated occupations; and also producing regulations or exacting habits of conduct resembling those enforced by human laws and polities. What seemed poetry in Virgil as to the bees, has been found to be only a part of the truth, as to their associations. The diminutive ants are still more extraordinary, and their wars have already been alluded to. That ants have slaves, and make expeditions, to capture other ants to reduce them to servitude (Messrs. Kirby and Spence say that they will sometimes travel one hundred and fifty paces to attack a negro colony); that they should keep smaller insects, the aphides, in order that they may milk them, or extract from their bodies a saccharine fluid for their own nourishment, as we take milk from cows; and that they should keep assemblages of these, as their separate and private property—such actions and habits are too like our own, not to be considered as those of a reasoning mind, not very dissimilar to that which we possess. Linnæus says that "the ant ascends trees that it may milk its cows, the aphides, not kill them." Kirby adds, that "ants make a property of these cows, for which they contend with great earnestness, and use every means to keep them to themselves. The greatest cow-keeper of all the ants, is the Yellow Ant of Gould (*Formica flava*). This species, which is not fond of roaming from home, usually collects in its nest a large herd of a kind of aphis, that derives its nutriment from the roots of grass and other plants. These it transports from the neighbouring roots; and thus,

without going out, it has always at hand a copious supply of food. These creatures share its care and solicitude equally with its own offspring."

All species of ants, petty as they are in size and appearance, perform actions, possess and preserve institutions, and display faculties and capacities, which seem on the whole, not to be inferior to those of any of the Animal Orders, but indeed to be superior to what is known, perhaps, of any. One kind of these, the Termites, or White Ants, is peculiarly useful to mankind, in consuming that dead animal and vegetable matter which, in warmer climates, would otherwise become a pestilential putridity; and there is no set of insects whose economy is more perfect. They exist together in kingdoms, and build cities, which are extremely populous. Mr. Smeathman has described the *Bellicosus* species in the "Philosophical Transactions," from his observations of them in Africa. They build a cone rounded at the top, several feet high, and of great extent. The walls are of clay, and so strong as to bear the weight of the heaviest animals. These contain a vast number of compartments. That in the centre always holds the king and queen; others are for her attendants, which are scarcely fewer than 100,000. They exist in the classes or forms of labourers and soldiers. When their cities are broken open, the soldiers march out with impetuosity, and attack everything that comes in their way. Wherever they strike they draw blood, and frequently beat off the bare-legged negroes. As soon as the assailant has withdrawn, the labourers issue forth in prodigious numbers, and very speedily erect a new wall.

* There is another remarkable ant, described by

* Kirby.

Col. Sykes, and called the Tree Ant, which inhabits the Western Ghauts in the Deccan, at an elevation of from two thousand to four thousand feet from the level of the sea. These ants are remarkable for forming their nests, called by the Mahrattas *moon-yeeara*, on the boughs of trees of different kinds; and their construction is singular, both for the material and the architecture, and is indicative of admirable foresight and contrivance; in shape they vary from globular to oblong, the longest diameter being about ten inches and the shortest eight. The nests consist of a multitude of thin leaves of cow-dung, imbricated like tiles upon a house, the upper leaves formed of one unbroken sheet, covering the summit like a skull-cap. The leaves are placed one upon another in a wavy or scolloped manner, so that numerous little arched entrances are left, and yet the interior is perfectly secured from rain. They are usually attached near the extremity of a branch, and some of the twigs pass through the nest. A vertical section presents a number of irregular cells, formed by the same process as the exterior. Towards the interior the cells are more capacious than those removed from the centre, and an occasional dried leaf is taken advantage of to assist in their formation. The nurseries for the young brood in different stages of development are in different parts of the nest. The cells nearest the centre are filled with very minute eggs, the youngest members of the community; those more distant with larger eggs, mixed with larvæ; and the most remote with pupæ near disclosure. In fact, in these last cells only were found winged insects. The female is in a large or royal cell, near the centre of the nest; she is about half an inch long, of the thickness of a crow-quill,

white, and the abdomen has five or six brown ligatures round it, like the female of the white ants; the head is very small, and the legs mere rudiments; she is kept a close prisoner, and incapable of motion in her cell, a circumstance in which these appear to approach the white ants, and which indicates that they should form a distinct genus. There was no store of provision in the nests; they were indebted therefore for their support to daily labour. We may gain some idea of their perseverance when we consider that the materials of which the nest was formed—cow-dung—must have been sought for on the earth, and probably carried from a considerable distance up the trees.

Kirby mentions an anecdote related to him also by Col. Sykes, with regard to an Indian species of ant, which he calls *the large black ant*, instancing in a wonderful manner their perseverance in attaining a favourite object, which was witnessed by himself, his wife and his whole household. When resident at Poonah, the dessert, consisting of cakes, fruit, and various preserves, always remained upon a small side table in a verandah of the dining-room. To guard against inroads, the legs of the table were immersed in four basins filled with water; it was removed an inch from the wall, and, to keep off dust through the open windows, was covered with a table-cloth. At first the ants did not attempt to cross the water, but as the strait was very narrow—from an inch to an inch and a half—and the sweets very tempting, they appear at length to have braved all risks, to have committed themselves to the deep, to have scrambled across the channel, and to have reached the object of their desires, for hundreds were found every morning revelling in enjoyment; daily vengeance was executed

upon them without lessening their numbers; at last the legs of the table were painted, just above the water, with a circle of turpentine. This, at first, seemed to prove an effectual barrier, and for some days the sweets were unmolested, after which they were again attacked by these resolute plunderers, but how they got at them seemed totally unaccountable, till the Colonel, who often passed the table, was surprised to see an ant drop from the wall, about a foot above the table, upon the cloth that covered it; another and another succeeded, so that though the turpentine and the distance from the wall appeared effectual barriers, still the resources of the animal, when determined to carry its point, were not exhausted; and by ascending the wall to a certain height, with a slight effort against it in falling, it managed to land in safety upon the table.

It is difficult to form an adequate conception of the swarms of locusts which infest various parts of the world, particularly Africa, and many accounts are on record of them, and also of the frightful devastations they commit on their progress, and of the utter inefficiency of all human means to arrest it. Mr. Barrow, in speaking of the interior of Southern Africa (1797), says, that in the part of the country where he was, the whole surface of the ground, for an area of nearly two thousand square miles, might literally be said to be covered with them. The water of a very wide river was scarcely visible on account of their dead carcases that floated on the surface, drowned in the attempt to get at the reeds that grew on it. They had devoured every blade of grass, and every green herb, except the reeds. They seem to be under some government or regulations, for Pallas, who has given a detailed account of them, says: "In serene weather they are

in full motion in the morning, immediately after the evaporation of the dew; and if no dew has fallen, they appear as soon as the sun imparts its genial warmth. At first, some are seen running about like messengers among the reposing swarms, which are lying partly compressed upon the ground at the side of small eminences, and partly attached to tall plants and shrubs. Shortly after, the whole body begins to move forward in one direction with little deviation," &c.

Birds are extremely social in their character, for besides the assemblages that take place at particular seasons in different species, as the goldfinches, the larks, the starlings, &c., others continue their association without interruption; such as the social grosbeak, whose nest has already been described, the various species of wild fowl, which can hardly be said to separate for the purpose of nidification, since they frequent the same district of marsh and swamp in the northern regions for that purpose, in immense flocks, and again take flight together towards the south; and the pee-wits and plovers, which always remain in flocks or families.

Few birds are more gregarious than the Rooks, being sometimes seen in flocks so great as almost to darken the air in their flight. In the parts of Hampshire adjacent to the New Forest, after the rooks have reared their progeny, they retire every evening at a late hour, during the autumn and winter months, to the closest coverts of the forest, having spent the day in the open fields and enclosures in quest of food:—

> "Retiring from the downs, where all day long
> They pick their scanty fare, a black'ning train
> Of loitering rooks thick urge their weary flight,
> And seek the shelter of the grove,"—

They retire in long strings, and having arrived at

their roosting place, they wheel round high in the air, and dive in a playful manner, exerting their voices, which, being softened by the distance, become a pleasing murmur, not unlike the cry of a pack of hounds in deep echoing woods. Mr. White, in his "Natural History of Selborne," speaks of a little girl, "who, as she was going to bed, used to remark on such an occurrence, in the true spirit of physico-theology, that the rooks were saying their prayers; and yet this child was much too young to be aware that the Scriptures have said of the Deity, that 'He feedeth the ravens who call upon him.'"

Fieldfares, again, which arrive in this country in great flocks from the northern parts of the continent, in the beginning of the autumn, return in the same manner to their native forests, and stud the huge fir-trees with their nests. With them, as with the rooks, it would appear that the sense of security occasions their associations, as they have evident marks of keeping watch, to remark and announce the approach of danger, and perhaps there are no birds more difficult of approach. The system of setting a watch to give the signal of danger is adopted generally by all the gregarious races of birds. These sentinels station themselves at some little distance from the main body, and in most instances on an eminence, from which they give the alarm by a peculiar cry; thus herons, when assembled in any numbers, and parrots when engaged in the plunder of a plantation, always place a look-out to give them warning of danger. Among the water-fowl, such as the Snow and Guinea geese, some of the ducks and the plovers, this is also the case. There is a wonderful spirit of sociality in the brute creation, independent of sexual attachment, which extends even to incongruous animals. Many

horses, though quiet with company, will not stay in a field by themselves; the strongest fences cannot restrain them. Oxen and cows will not fatten by themselves, but will neglect the finest pasture that is not recommended by society. It would be needless to instance sheep, which always flock together. A doe, brought up from a little fawn with a dairy of cows, attended them regularly to their pasture, and returned with them to the yard. The dogs of the house took no notice of her from being used to her; but if strange dogs came by, she led them over gates and fences till she returned to the cows, which, with menacing horns, drove them fairly out of the pasture. A person having but one horse and a solitary hen, these two incongruous animals spent much of their time together in a lonely orchard, where they saw no creature but each other. By degrees, an apparent regard began to take place between these two sequestered individuals. The fowl would approach the horse with notes of complacency, rubbing herself gently against his legs, while the horse would look down with satisfaction, and move with the greatest caution and circumspection, lest he should trample on his diminutive companion.

* A gentleman travelling through Mecklenburgh, some years since, witnessed a singular association of incongruous animals. After dinner, the landlord of the inn placed on the floor a large dish of soup, and gave a loud whistle. Immediately there came into the room a mastiff, an Angora cat, an old raven, and a remarkably large rat, with a bell about its neck. They all four went to the dish, and, without disturbing each other, fed together; after which the dog, cat, and rat, lay before the fire, while the raven hopped about the

* Bingley.

room. The landlord, after accounting for the familiarity of these animals, informed his guest that the rat was the most useful of the four; for the noise he made had completely freed his house from the rats and mice with which it was before infested.

Among social quadrupeds, the beavers are pre-eminent, not only for their family union, but for their joint labours in constructing their dams and in the provision of food. The Alpine marmot is another instance, but does not approach the beaver in instinct. It is affirmed of them by M. Beauplan that the labour of collecting the materials for their nest is carried on by the animals in concert; that some of them cut the finest herbage, which is collected by others, and that they transport it to their holes in the following manner: One, it is said, lies down on its back, allows himself to be loaded with hay, and extends his limbs; and others trail him, thus loaded, by the tail, taking care not to overset him. However this may be, it is certain that they dwell together, and work in common in their habitations, where they pass three-fourths of their lives.

There are many of the gregarious mammalia which make common cause in defending themselves, converting even defence into attack, till they not unfrequently fall victims to their gallantry and pertinacity. Speaking of the watchfulness of the walrus, Captain Cook remarks, that the whole herd were never found asleep, some being always on the watch; and these, on the approach of a boat, would rouse those next to them; and the alarm being thus gradually communicated, the whole herd would be awake presently. Their first object is to escape, but being foiled in this, they defend themselves with boldness, and conduct themselves with a gallantry perfectly remarkable. Sir

Edward Parry speaks particularly to this point: he says, on meeting with these animals in Fox's Channel, "We saw two hundred, lying piled, as usual, over each other, on the loose drift ice. A boat's crew from both the Hecla and Fury proceeded to the attack; but these gallant amphibia, some with their cubs mounted on their backs, made a desperate resistance, and one of them tore the planks of a boat in two or three places. Three only were killed." Captain Phipps, afterwards Lord Mulgrave, fell in with them on his attempted voyage to the North Pole, in 1773, and describes a scene which occurred on an island to the north of Spitzbergen. He says, "Two officers engaged in an encounter with a walrus, from which they came off with little honour. The animal, being alone, was wounded in the first instance; but, plunging into the deep, he obtained a reinforcement of his fellows, who made an united attack upon the boat, wresting an oar from one of the men, and had nearly upset her, when another boat came to their assistance."

The sagacity with which the bisons defend themselves against the attack of wolves is admirable. When they scent the approach of a drove of those ravenous creatures, the herd throws itself into the form of a circle, having the weakest and the calves in the middle, and the strongest ranged on the outside; thus presenting an impenetrable front of horns.

The wild horses collect in herds of several hundreds, subdivided into smaller troops, each headed by a stallion. They prefer wide, open, elevated steppes, and always proceed in lines or files, usually with the head to windward, moving slowly forward while grazing, the stallions leading and occasionally going round their own troop. Young stallions are often at some distance,

and single, because they are expelled by the older until they can form a troop of young mares of their own. Their heads are seldom observed to be down for any length of time; they utter now and then a kind of snort, with a low neigh, distinguishable from any domestic species. They have a remarkable piercing sight; the point of a spear, at a great distance on the horizon, seen behind a bush, being sufficient to make a whole troop halt; but this is not a token of alarm; it soon resumes its march, till some young stallion on the skirts begins to blow with his nostrils, moves his ears in all directions with rapidity, and trots or scampers forward to reconnoitre, bearing his head very high, and his tail out; if his curiosity is satisfied, he stops and begins to graze, but if he takes the alarm, he flings up his croup, turns round, and, with a peculiarly shrill neighing, warns the herd, which immediately turns round and gallops off at an amazing rate, with the stallions in the rear, stopping and looking back repeatedly, while the mares and foals disappear as if by enchantment, because, with unerring tact, they select the first swell of ground or ravine to conceal them until they reappear at a great distance, generally in a direction to preserve the lee-side of apprehended danger. Although bears and wolves occasionally prowl after a herd, they will not venture to attack it, for the sultan stallion will instantly meet the enemy, and rising on his haunches, strike him down with the fore-feet; and should he be worsted, which is seldom the case, another stallion becomes the champion; and in the case of a troop of wolves, the herd forms a close mass, with the foals within, and the stallions charge in a body, which no troop of wolves will venture to encounter.

The Ursine Cape baboons descend from the mountains into the plains to pillage gardens, and then place sentinels to guard against surprise. The Chinese monkeys station one of their body on some adjacent tree, while they plunder the sugar-canes. He screams if a person is approaching; and then, each grasping as many canes as he can under one arm, runs off on three legs. The four-fingered monkeys and pigmy apes also plunder together, and place a sentinel.

> "Destructive, on the upland sugar groves
> The monkey nation preys; from rocky heights,
> In silent parties, they descend by night,
> And posting watchful sentinels, to warn
> When hostile steps approach, with gambols, they
> Pour o'er the cane-grove. Luckless he to whom
> The land pertains!"

The llamas, among their native mountains, associate in large herds, in the highest parts. While the rest feed, one watches as a sentinel. When he hears any intruder approach, he gives a kind of neigh, and the herd runs off. After galloping to a considerable distance, they stop, turn round, gaze at their pursuers until these come near, and then again off. The wild asses live in herds, each consisting of a chief and several mares and colts, to the number of twenty sometimes. They are very timid and provident against danger. A male takes on him the care of the herd, and is always on the watch. If they observe a hunter, the sentinel takes a great circuit, and goes round and round him, as if discovering something to be apprehended. As soon as he is satisfied with this, he rejoins the herd, and all set off with precipitation. The Scythian antelopes seldom all rest together; some are generally stationed on the watch; and when these are tired, they give a kind of notice to such as have

taken their rest, who then rise and release the sentinels. The sheep in the Welsh mountains graze in parties of about a dozen, and one of these is stationed at a distance, to give notice of danger. If it sees any one approaching, it looks at him till he comes within a distance of eighty or one hundred yards; and if he still advances, it alarms its comrades by a loud whistle, two or three times repeated, and all scour off to the steepest parts.

*The beavers of North America associate together for carrying on their wonderful operations, in which they surpass the ingenuity of all other quadrupeds. They begin to assemble in June and July from all quarters, till they form a troop of two or three hundred near some brook or river. Here they make an embankment, cut the smaller trees into proper lengths for staves; fix these like piles, interweave them with smaller branches, beat earth into a kind of mortar, ram it into all the vacancies, till they have made a solid dyke ten or twelve feet thick at the base, sloping to three at the top, with shallow gaps to let the water escape. Near this they build their cabins on piles, and wattle them with branches, and with two doors, one to go into the water, the other on the land. These have sometimes three or four stories, holding from eighteen to twenty beavers, and each village or community has from ten to twenty cabins.

Wild swine associate in herds, and defend themselves in common. Green relates that in the wilds of Vermont a person fell in with a large herd in a state of extraordinary restlessness; they had formed a circle with their heads outwards, and the young ones placed in the middle. A wolf was using every artifice to snap

* Kerr's Linn.

one, and on his return he found the herd scattered, but the wolf was dead, and completely ripped up. Schmarda recounts an almost similar encounter between a herd of tame swine and a wolf, which he witnessed on the military frontiers of Croatia. He says that the swine, seeing two wolves, formed themselves into a wedge, and approached the wolves slowly, grunting and erecting their bristles. One wolf fled, but the other leaped on the trunk of a tree. As soon as the swine reached it, they surrounded it with one accord, when, suddenly and instantaneously, as the wolf attempted to leap over them, they got him down and destroyed him in a moment. Cuvier quotes an instance of an attempt at mutual assistance in the field-mouse. One being caught in a meadow, screamed loudly, when a number of its comrades hastened to the spot in great anxiety, and tried to liberate it.

Wild dogs unite in packs to hunt, and attack buffaloes, and even tigers. Nature seems to have implanted an innate hostility between the canine and feline genera. The hyæna, the dhole, and other wild dogs, are reported to destroy all tiger cubs they can find; and the last-mentioned, in particular, enabled by their superior instinct to hunt in packs and combine their attacks, are even more than a match for the most powerful of the Felinæ. It is to this peculiar instinct, no doubt, that the desire of tigers to escape from the presence of sporting dogs, so often observed in India, is mainly to be ascribed. Jackalls congregate in great numbers, sometimes as many as two hundred being found together, and they howl so incessantly, that the annoyance of their voices is the theme of numerous apologues and tales in the literature of Asia. They retire to woody jungles and rocky situations, or

skulk about solitary gardens, hide themselves in ruins, or burrow in large communities. If by chance one of the troop be attacked, all are on the watch, and, if practicable with self-preservation, issue forth to the rescue. The Kamtschadale dogs, whose services are unnecessary to their masters, on the cessation of winter are turned loose to shift for themselves, and, forming into packs, they hunt and pick up a precarious living together. The association of dogs together for the purpose of self hunting is by no means of an unusual occurrence, and many very interesting and sagacious traits are recorded of them. At Palermo, among the idlers and unnecessary consumers of provisions, may be reckoned the extraordinary quantity of dogs wandering about without owners; among the number, two, of the wolf breed, were particularly distinguished for their deadly animosity to cats. One day, they were in pursuit of a cat, which, seeing no other place of refuge near, made her escape into a long earthen water-pipe, which was lying on the ground. These two inseparable companions, who always supported each other, pursued the cat to the pipe, where they halted and consulted what was to be done to deceive and get possession of their enemy. After they had stood a short time, they divided, took post at each end of the pipe, and began to bark alternately, to give the cat reason to suppose they were both at one end, and to induce her to come out. This really astonishing cunning soon had a successful result, and the cheated cat left her hiding-place. Scarcely had she ventured out, when she was seized by one of the dogs; the other hastened to his assistance, and in a few moments deprived her of life.

Lieut. Shipp, in his memoirs, says: "A Cape baboon

having taken off some clothes from the barracks, I formed a party to recover them. With twenty men, I made a circuit to cut them off from the caverns, to which they always fled for shelter. They observed my movements, and detaching about fifty to guard the entrance, the others kept their post. We could see them collecting large stones and other missiles. One old grey-headed one, who had often paid us a visit at our barracks, was seen distributing his orders as if a general. We rushed on to the attack, when, on a scream from him, they rolled down enormous stones upon us, so that we were forced to give up the contest.

Most of the Pecora and Glires genera, and some of the Belluæ, associate in flocks or herds, seek each other's society, and have a visible pleasure in being together, even when of different species. It is amusing to watch horses and cows, of different fields and owners, mutually approach hedges and gates to each other; remaining for some time looking at and often licking each other.

Schiller, in alluding to the gregarious habits and vigilance of wild geese, says :—

> " When they go forth to graze, with jealous care
> They place a watch, which, with keen ear intent
> On coming danger, sounds its shrill note,
> And warns the ready flock."

A fine old gander, which had lived from youth to age in a sequestered spot on the banks of the Solway had become a great favourite with its owner, who used to take much pleasure in seeing the sentinel geese strutting through the long grass, rebuking the approach, of every stranger, and leading forth a long train of cackling young, to dip their shooting pinions in the Solway. One season, however, either the demands for

a Christmas goose, or the midnight depredations of the fox or foumart, had become so numerous, that the poor old gander was left without a single helpmate—a misfortune which he deplored day and night by many a doleful and sorrowful note. These affectionate repinings did not escape the observation of its owner's servants, and orders had just been given for replacing the extirpated breed of geese, when the widowed biped suddenly disappeared, to the great regret of the whole family. One blamed the fox, another the foumart, and a third the gipsies; but the event proved they were all mistaken; for one morning, as Mr. Craig was entering the breakfast parlour, he heard a well-known cackle, and immediately exclaimed, "If the old Stag had not been drowned or worried, I could have sworn it was his cry." The call was immediately repeated, and on going out to the lawn, or on looking out of the window, Mr. Craig beheld the identical old gander, surrounded by a whole flock of bonny lady geese, whose approach he was thus proudly announcing, and whose wings were still dripping with the brine of that element through which he had taught them to pilot their way for a distance of at least twelve or fifteen miles.

This singular occurrence naturally excited a great deal of interest, and after making every inquiry, it appeared that the gander had either been carried away by the force of the tide, or had voluntarily swam to the opposite shore, where, landing on some English farm, he had attached himself to one of the owner's geese, and sojourned with her till she had hatched a pretty numerous brood. At length, finding that he had reared up another family, to re-people his favourite retreat, or being attracted by the woods of his old

haunts, while sporting on the Solway on some clear sunny day, he once more ventured to cross the water, carrying with him his English spouse and her whole brood.

A gentleman procured and brought up a young sparrow-hawk. This was rather hazardous, as he, at the same time, had a large stock of fancy pigeons, which, in consequence of their rarity and value, he greatly prized. It seemed, however, that kindness and care had softened the nature of the hawk, or the regularity with which it was fed rendered the usual habits of his family unnecessary to his happiness; for as he increased in age and size, his familiarity increased also, leading him to form an intimate acquaintance with a set of friends who have been seldom seen in such society. Whenever the pigeons came to feed, which they did sometimes from the hand of their master, the hawk used also to accompany them. At first the pigeons were shy, of course; but, by degrees, they got over their fears, and ate as confidently as if the hawk were not present. He would attend the pigeons in their flight round and round the house and gardens, and perch with them on the chimney-top, or roof of the mansion; and this voyage he never failed to make early in the morning, when the pigeons always took their exercise. At night he retired with them to the dovecote; and though for some days he was the sole occupant of the place, the pigeons not having relished this intrusion at first, he was afterwards a privileged guest there; for he never disturbed his friends, even when their young ones, unfledged and helpless as they were, offered a strong temptation to his appetite. He seemed unhappy at any separation from the pigeons, and invariably returned to the dove-

house after a few days' purposed confinement in another abode, during which imprisonment he uttered most melancholy cries for deliverance.

With the exception of birds of prey, and a few others, all the feathered tribes seem to have a general tendency towards association, either in flocks, or family parties, or pairs. The woodlark does not unite in companies, but it associates in its own little family parties. From Van Diemen's Land, a gentleman writes—"In the woods, the parrots and parroquets are social and almost tame. I have had at one time fifty flying around me, sparkling in the sunbeams like so many gems." * In Pennsylvania, the goldfinches associate in flocks; frequently assembling in great numbers on the same tree, to bask and dress themselves in the morning sun, singing in concert for half-an-hour together. The titmouse species associate in parties of six, eight, or more, attended by the Carolina nuthatch, the brown creeper, and small spotted woodpecker; the whole forming a very nimble and restless company, whose food, manners, and disposition are very much alike. So the tree and song sparrows unite in flocks, and form societies with other birds.

† The linnet delights and lives in society, frequenting open commons and gorsy fields. Several pairs, without the least rivalry or contention, build their nests and rear their offspring in the same neighbourhood. They form large associations, feeding and moving in company as one united household. Resorting to the head of some sunny tree, they will pass hours in the enjoyment of the warmth, chattering with each other in low and gentle notes.

The jay and its family associate, during all the autumn

* Wilson. † Knapp.

and winter months, taking great delight in each other's company. They separate only to become founders of new establishments. Delight in society is a predominant character in starlings. To feed, they will associate with the rook, the pigeon, or the daw; but they chiefly roost with their own families. These social birds are rarely seen alone. Should any accident separate an individual from the companions of its flight, it will sit disconsolate on an eminence, piping and plaining, till some one of its congeners joins it. Even in small parties they keep continually calling and inviting associates to them with a fine clear tone. They vastly delight, in a bright autumnal morning, to sit basking and preening themselves on the summit of a tree, chattering all together in a low song-like note.

IMITATION.

As a society of several individuals is generally composed of the members of one family, or of a community, it naturally follows that their habits and dispositions are the same, or bear a strong resemblance to each other; and, in the same manner, the example of one individual may call forth corresponding actions in another, and awaken a desire of imitation.

This spirit of imitation, or sympathy of one animal with another, is found chiefly in the higher orders of animals, and is perceivable in the voice, the habits, and actions.

The voice of one animal calls forth that of another; the chirping of a cricket is echoed immediately by others,

and the croak of a frog is responded to through the whole marsh; a singing-bird strikes its notes, and is soon answered by a general accompaniment. This mutual response is even sometimes irresistible: Le Vaillant's monkey, which had the greatest dread of his wild comrades, and hid himself from fear when he heard their cries, could not refrain from answering them.

Many animals imitate the voices of other species, and even of man, as parrots, starlings, and ravens, some almost without the trouble of instruction. The chimpanzee makes an effort to speak by grimacing, opening its lips and uttering its "hu, hu," more loudly. Dogs have been taught to pronounce words. The "Dumfries Journal," of January, 1829, mentioned a dog, as then living in that town, which uttered distinctly the word "William"—the name of the person to whom it was attached. Leibnitz vouched for a fact which he communicated to the Académie Royale at Paris, but which they say they should have doubted had it not been asserted by so great a man. He says that he heard a peasant's dog, whose son had taught it when three years old, articulate distinctly thirty words. Many birds, as the thrush, and others of the stare tribe, imitate the voices of other birds, and a young canary, reared by the side of a nightingale or lark, acquires their song. Burdach mentions one, which, hearing the notes of a titmouse that frequented his garden, imitated them perfectly. The mocking-bird of America possesses not only natural notes of its own, which are truly musical and solemn, but it can at pleasure assume the tone of every other animal in the forest, from the humming-bird to the eagle, and descending even to the wolf and raven. One of them, confined in a cage, has been

heard to mimic the mewing of a cat, the chattering of a magpie, and the creaking of the hinges of a sign-post in high winds. The Mexicans, on account of his various notes and imitative powers, call him "the bird of four hundred tongues." The minor grakle (*Gracula religiosa*) is remarkable for whistling, singing, and talking well; much more so than any of the parrot kind, and is particularly distinct in its utterance.

A dog, brought by Quoy from Australia, soon acquired the bark of the European species, and a young wolf reared among dogs adopted entirely their cry.

The power of imitation is very great, and often extremely ludicrous in monkeys, from the expressive face, and human-like form of the upper parts. This talent has been said to have been used to their own destruction; we have heard of monkeys cutting their throats, in imitation of the feigned action of the person whom they annoyed, and of one which killed itself by infusing a paper of tobacco with milk and sugar instead of tea, and drinking it as it had observed a sick sailor do. How far these are true we shall not attempt to decide; certain it is, that these animals most ludicrously possess this propensity, and that those we have seen as *pets*, would almost perform anything once pointed out to them, and would always make the attempt. Anecdotes illustrative of their freaks might be multiplied *ad infinitum*. When Messrs. Condamine and Bouger, the astronomers, were engaged in measuring the length of a degree in Peru, some large monkeys were admitted into their rooms, during the time that they were making their observations in the mountains. These animals, of their own accord, went through a series of imitations of their actions. They planted the signals, ran to the

pendulum, and then to the table, as if to commit their remarks to paper. They occasionally pointed the telescope to the skies, as if to survey the planets or stars. Harris, in speaking of the imitative power of monkeys, says that the Indians turn the faculty to their destruction; for, coming to their haunts with basins full of water or honey, they wash their faces in the sight of these animals, and then, substituting pots of thin glue instead of the water or honey, they retire out of sight. The monkeys, as soon as they are gone, come down and wash their faces likewise, and sticking their eyes together, become blind, and are easily taken. In other places they brought boots into the woods, and putting them on and off, left them, well lined with glue, or a sort of bird-lime; so that when the unhappy monkeys put them on, they stuck fast, and hindered their escape. An oran-otan brought up by Père Carbasson became so fond of him, that wherever he went, it always seemed desirous of accompanying him; whenever, therefore, he had to perform the service of his church, he was under the necessity of shutting him up in a room. Once, however, the animal escaped, and followed the father to the church; where, silently mounting the sounding-board above the pulpit, he lay perfectly still till the sermon commenced. He then crept to the edge, and, overlooking the preacher, imitated all his gestures in so grotesque a manner, that the whole congregation were unavoidably urged to laugh. The father, surprised and confounded at this ill-timed levity, severely rebuked his audience for their inattention. The reproof failed in its effect; the congregation still laughed, and the preacher, in the warmth of his zeal, redoubled his vociferations and actions: these the ape imitated so exactly, that

the congregation could no longer restrain themselves, but burst out into a loud and continued laughter. A friend of the preacher at length stepped up to him, and pointed out the cause of this improper conduct; and such was the arch demeanour of the animal, that it was with the utmost difficulty he could command the muscles of his countenance, and keep himself apparently serious, while he ordered the servants of the church to take him away.

Animals living in societies often copy or imitate the actions of an individual leader; and, among insects, this is particularly remarkable with the Procession caterpillars, which move more or less in processional order. The procession is always headed by a single caterpillar; sometimes the leader is followed by one or two in a single file, and sometimes by two or three abreast, and the whole train pursues his track through every turn and sinuosity without the slightest deviation. Wild fowl, in the various forms they assume in their flight, are led by one individual, whose movements direct the flock. Sheep are particularly prompt in following the example set by one of their body; for if one breaks the fold, passes a hedge, leaps a ditch, or in terror takes the water, the others follow blindly and obstinately. As a butcher of Appleby was driving a flock of sheep over the bridge, one of them suddenly leapt over the parapet into the river. Another sheep followed, and then a third, and the whole flock would have gone after their companions if they had not been with some difficulty prevented. The height from the bridge to the river is at least twenty feet, and the water fortunately deep. One of the sheep swam boldly to the north side of the river, and the other two to a bank of shilloch which formed a sort of island, whence they

were got out with some trouble. These sheep were of the mountain breed; black-faced wethers, as strong and nimble as deer. Sir Capel de Broke, in describing a winter's journey in Lapland, says: "In proceeding along the extensive and endless lakes of that country, if the number of reindeer be great, a close and lengthened procession is invariably formed; each deer following the foremost sledge so closely, that the head of the animal is generally in contact with the shoulders of the driver before. Should the guide alter his direction, by making a bend to the right or the left, the whole of the deer in the rear will continue their course till they arrive at the spot where the turn was made. It thus frequently happens, that, when the distance between the hindmost and foremost deer is great, the guide making a bend, considerable saving might be obtained by cutting across. This, however, it is scarcely possible to do; for should the animal be pulled by main force out of its former course, it will immediately turn aside from the new direction it is placed in, and regain the old track, in spite of all the driver can do to prevent it."

If a horse bolts under the influence of terror or alarm, its companion receives the impetus, and they plunge on with maddening speed. The most tractable and docile horse becomes infected if placed with one of an opposite character, or, on the contrary, a cure is effected. A horse accustomed to shy at particular objects, will often lose the vice by being placed with one of a less excitable temperament.

COMMUNICATION, LANGUAGE.

This is a necessary consequence of the social life in animals, and, like the previous subject, imitation, is the growth of the social impulse. That it is necessary is obvious, since to render the attainment of a common object possible in a community, animals must have a means of communication with each other, without which the demand for mutual help would not be practicable.

The language of animals is an instinctive expression of its inward conceptions and wants, by signs, looks, or voice; but it is not able to convey intelligence which is not immediately connected with its own state or that of the community. The lower orders of animals, particucularly insects, communicate by signs, and the organs employed for that purpose are the feelers, as in bees and ants, which, like every other animal living in society, require a medium of communication. The effects produced upon the former by the loss of their queen will furnish proof of this fact. In a well-peopled and thriving hive, each bee is employed in its appropriate avocation—some in attending the young, some in making cells. At first, when the queen has been abstracted, everything goes on well for about an hour: after this space of time, some few of the workers appear in a state of great agitation; they forsake the young, relinquish their labour, and begin to traverse the hive in a furious manner. In their progress, whenever they meet a companion, they mutually cross their antennæ,

and the one which seems first to have discovered the national loss, communicates the sad news to its neighbour, by giving it a gentle tap with these organs. This one in its turn becomes agitated, runs over the cells, crossing and striking others. To make out the use of the antennæ, Huber tried various experiments by amputating them altogether, and the results were very remarkable. The queen ran about the combs, dropped her eggs anywhere, and became perfectly helpless; the workers neglected their labours, ran into corners, or to some sunny spot, and ultimately quitted the hive never to return. Hence it would seem that the antennæ are the organs of communication, and, as a further proof of it, the sentinels, on a moonlight night, may be seen patrolling round their habitation with these feelers stuck out. If some unhappy moth, slyly endeavouring to steal into the habitation, happens to come in contact with them, the signal is made, and a body of guards soon rush out to chastise the interloper.

Attachment to the female is not the only instance of affection evinced by ants; they, as well as bees, appear to recognise each other even after a long absence. Huber, having taken an ant-hill from the woods, placed it in a glass hive; finding that he had a superabundance of ants, he allowed some of them to escape, and these formed a nest in his garden. Those which were in the hive, he carried into his study, and observed their habits for four months, after which he placed the hive in the garden within fifteen paces of the natural nest. Immediately, the ants established in it recognised their former companions, with whom they had held no communication for four months: they caressed them with their antennæ, and, taking them up in their mandibles, led them to their own nest. Presently others arrived

in crowds, and carried off the fugitives in a similar manner; and, venturing into the artificial ant-hill, in a few days caused such a desertion that it was wholly depopulated.

The above anecdote seems to prove that ants have a language of dumb signs, of which the organs are the antennæ. As yet, the proofs of this antennal language have been drawn from the affections of these creatures, but more striking ones are to be derived from their passions; for there are few animals in which the passions assume a more deep and threatening aspect; they unite themselves in myriads for the purposes of war and extermination.

Dr. Franklin found some ants feasting on some treacle in his closet. He shook them out, and suspended the pot by a string from the ceiling. One ant had happened to remain, and after eating its fill, found its way up the string, with some difficulty, crawled on to the ceiling, and thence along the wall to its nest. In less than half an hour a great company of ants sallied out of their hole to the ceiling, and crept along the string into the pot. This was done by others, till the treacle was all consumed; one body running up the string from the sweet, while another passed down to it. The Doctor inferred that the first ant had communicated to its comrades the new position of their delicacy, and directed them to the only accessible road to it.

Mr. Jesse says that "nature has given to ants a language of communication, by the contact of their antennæ. With these organs, they are enabled to render mutual assistance in their labours and dangers, discover again their route when they have lost it, and make each other acquainted with their necessities." He adds

respecting wasps: "if a single wasp discovers a deposit of honey or other food, he will return to his nest, and impart the good news to his companions, who will sally forth in great numbers to partake of the fare."

A *scarabæus* making a pellet of dung for the reception of its egg, rolled it to the summit of a small hillock, but it fell into a hole, from which all the efforts of the beetle could not extricate it. After several ineffectual trials, the insect repaired to an adjoining heap of dung, and soon returned with three of his companions. All four now joined, and succeeded in pushing out the pellet, when the three assistant beetles left the spot and returned to their own quarters.

The higher classes of animals obviously communicate their wishes and ideas to each other by signs. Cattle and horses by biting the corresponding part on each other, indicate the service they wish to have performed on themselves.

Two goats grazing about the ramparts of Plymouth citadel, got down upon the narrow ledge of the rock, and one of them advancing before the other till it came to an angle, was enabled to return: but in its way back it met its companion, which produced a most perplexing dilemma, as it was impossible for them to get past each other. Many persons saw them without being able to render any assistance. After a considerable time one of the goats was observed to kneel down with great caution, crouching as close as it could lie; which was no sooner done, than the other, with great dexterity, walked over him, and they both returned the way they came in perfect safety. And at Ardinglass, near Glenarm, in Ireland, two goats moving towards each other, over a precipice one thousand feet high, on a narrow ledge of rock, were seen to extricate themselves

from danger by a similar expedient. In both these instances the animals looked at each other for some time, as if they were considering their situation, and deliberating what was best to be done in the emergency.

The martin builds on the outside of houses, under the eaves; and when it has built its nest, the sparrow frequently takes forcible possession of it. The martin, unable to dislodge the intruder, convokes his companions, some of whom guard the captive, while others bring clay, and completely closing up the entrance of the nest, fly away, leaving the sparrow to be suffocated, and to perish from hunger.

Many insects possess a voice, or the power of extracting a sound by some muscular action of their bodies; which sounds, whether by the way of challenge, of calling, or of pleasure, are so many means of expressing their sensations, and even their wants: the chirping of a cricket is immediately responded to by its neighbour, like the challenge of a cock; the *ptinus*, or death-watch, which makes a ticking noise by beating its head with great force against the substance on which it stands, invites its female; and the deafening din of the *cicadæ*, seems to proceed from an exuberance of joy.

The *walrus*, as described in p. 305, plunges into the deep, and summons others of its race to its assistance.

There is a beautiful species of the lizard tribe, called the monitor, a native of South America, said to be so attached to the human race, that by a sort of loud and shrill whistle, it warns mankind of the approach of alligators, serpents, and other noxious animals. Southey, in his "Life of Nelson," intimates that the life of that hero would, in all probability, have been

much shorter, but for the timely warning of one of these animals. When about to attack the Castle of St. Juan, one of his men was bitten under the eye by a snake, which darted at him from the bough of a tree. He was unable to proceed from the violence of the pain, and when, after a short time, his comrades were sent back to assist him, he was dead. Nelson himself narrowly escaped a similar fate. He had ordered his hammock to be slung under some trees, being excessively fatigued, and was sleeping, when a monitory lizard passed across his face. The Indians happily observed the reptile, and knowing what it indicated, awoke him. He started up, and found one of the deadliest serpents of the country coiled up at his feet.

That animals possess the means of communicating with one another, and of expressing their ideas and wants will admit of no question, but how this is effected is beyond all human observation, although in some cases the gestures of the animal with reference to some particular object before him render the interpretation easy. A gentleman who was in the habit of occasionally visiting London from a distant county performed the journey on horseback, accompanied by a favourite little terrier dog, which he left at an inn at some distance from London till his return. On one occasion on calling for his dog the landlady told him that it was lost; it had had a quarrel with the great house dog, and had been so worried and bit that it was thought he would never recover, but at the end of a few days he crawled out of the yard, and no one saw him for almost a week, when he returned with another dog bigger than his enemy, on whom they both fell and nearly destroyed him. This dog had actually travelled to its own home at Whitmore in Staffordshire, had coaxed away the

great dog in question, which followed him to St. Alban's to assist in resenting the injury of its friend. The following story is related of a little spaniel which had been found lame by a surgeon at Leeds. He carried the poor animal home, bandaged up its leg, and after two or three days turned him out. The dog returned to the surgeon's house every morning till his leg was perfectly well. At the end of several months, the spaniel again presented himself in company with another dog, which had also been lamed; and he intimated, as well as piteous and intelligent looks could intimate, that he desired the same assistance to be rendered to his friend as had been bestowed upon himself. The combination of ideas in this case, growing out of the recollection of his own injury, and referring that to the cure which had been performed; the compassion he had for his friend to whom he communicated the occurrence, and induced to seek relief under his guidance, together with the appeal to the humane surgeon, is as extraordinary a piece of sagacity as can be found in all the annals of animals.

Animal language is chiefly confined to expressions of sensation and of desire of some kind, and even an unpractised ear can discriminate between the notes of joy and pain, of anger and fear, of hunger and distress, of rage and lust. The voice again, when exerted in cries for assistance, is changed and modulated into sounds of thankfulness and satisfaction. A cow ran hastily up to a gentleman's bailiff as he entered a field, who mistaking her intention moved away, and she then stopped and bellowed in a distressing manner, as if to gain his attention. Seeing him look towards her, she went to a ditch, and again bellowed loudly. He walked to it, and saw a calf on its back almost lifeless from its

ineffectual struggles to release itself. Audubon relates that birds whose nests are attacked by snakes, raise a loud and piteous cry of alarm, which collects an assemblage of other birds, who join in a furious attack on the reptile and compel it to retreat, and even at times destroy it.

Most animals utter sounds of some sort or other, which they can vary into as many tones as are necessary to give vent to their feelings, to denote their wants, or to communicate with one another. Whoever has taken the trouble to watch a poultry-yard, must have perceived that each species uses particular modifications of sound to their brood and fellows to signify what they wish them to understand, and each seems perfectly to comprehend the meaning of the speaker. Among fowls, at their accustomed hour of being fed, if it be delayed, all are clamorous for it. The cock repeatedly calls his hens to the grain, if they be absent, and these their chickens. The maternal notes, to express danger to the brood; those of anger against an assailant; of alarm at their own peril; and their calls for each other, when those accustomed to be together are separated and unseen, are very distinguishable. All these are appropriated to their respective sensations, and are only repeated as these occur. Ray has remarked the different voices of the hen, when she broods—when she leads her chickens—when she has found food, and calls them to it—when she would alarm them to seek shelter—when she is angry—when she has laid an egg—when in pain or in great fear—all significant—being effects of the several passions of anger, grief, fear, or joy. Again, if a fowl flies down from an eminence, with what a cheer and hurrah is it welcomed to terra firma, and with what

congratulations is the announcement of an egg being laid received by the whole tribe!

Many animals have been remarked for their communications by utterance to each other. The chamois, when alarmed, advertise each other of their feelings by a kind of whistle. The one on watch continues this as long as he can blow without taking breath. He then stops for a moment, looks round on all sides, and begins whistling afresh, which he continues from time to time. He leaps on the highest stones he can find, again looks round, leaps from one place to another, and when he discovers anything seriously alarming, flies off.

Many of the ape species when beaten will sigh, groan, and weep like children. The four-fingered monkey, when touched, utters a plaintive kind of cry, but has another sound, which it emits as a testification of delight at receiving any kind of food. When female seals come out of the sea, they bleat like sheep for their young.

Marcgrave gives a singular account of the Ouarine monkey: he says, "I have frequently been a witness of their assemblies and deliberations. Every day they assemble in the woods to receive instructions. One then takes the highest place on a tree, and makes a signal with his hand for the rest to sit round. As soon as he sees them placed, he begins his discourse in a loud and precipitate voice: the rest observe a profound silence. When he has done, he makes a sign with his hand for the rest to reply. At that instant they raise their voices together, until, by another signal, they are enjoined silence. At last the assembly breaks up." The following incident is related as having occurred on the rock of Gibraltar, where it is well known that the

only European colony of monkeys exists. A party of soldiers occupying an advanced post during the celebrated siege, and being ordered to lie concealed, observed a troop of monkeys advance with an old grey-headed baboon, carefully guarded, in the centre. To use the words of the witness, who describes it as a *Monkey Court*, "They arrived, halted, and detached their prisoner to a small distance, where he remained between two monkeys, who had the charge of him. The rest formed a sort of court, before which an advocate evidently accused the prisoner of some offence, he weeping, screaming, and frequently interrupting the attorney-general. Indeed, the proceedings seem to have been altogether irregular, for the judges, advocate, and prisoner were all screaming together. At length, however, an old monkey, whom the soldiers insisted was the chief justice of the woods, screamed louder than the rest, and the prisoner was instantly hurried off, and precipitated over a projecting rock. The soldiers were much scandalised at this proceeding, being convinced that the old baboon was too helpless to have deserved his punishment, and that he was sacrificed under some false accusation, to prevent his being burthensome to his parish."

Wenzel, in his analysation of the animal voice, says that distress and trouble are expressed by a dissyllabic sound, as with dogs and cats when deprived of their young—with hens, when their foster brood of ducklings plunge into the water—and with birds when alarmed by a bird of prey; that satisfaction and pleasure are denoted by quick consecutive notes, and displeasure by indistinct and hasty sounds; soft and prolonged notes are the expression of love, boisterous ones those of joy; impetuous, inharmonious, and sharp tones betoken

anger, and when monosyllabic, hollow and continued, sadness.

The voice in animals has reference to some immediate object of perception, or to some want, of which they are reminded by instinct or memory; and as they seem to be nearly incapable of forming any abstract notions or speculations apart from sensible objects, the want of articulate language must ever oppose an insurmountable barrier to their progress in acquired knowledge, beyond individual experience.

A gentleman of Inverness, while passing through a lonely and unfrequented district, on a journey in the Highlands, observed a sheep hurrying towards the road before him, as if to interrupt his progress, and at the same time bleating most piteously. On approaching nearer, the animal redoubled its cries, and, looking significantly in the face of the traveller, seemed to implore some favour or assistance at his hands. Touched with a sight so unusual, the gentleman alighted, and leaving his gig, followed the sheep to a field in the direction whence it came. There, in a solitary cairn, at a considerable distance from the road, the sheep halted, and the traveller found a lamb completely wedged in between two large stones of the cairn, and struggling feebly with its legs uppermost. He instantly extricated it and placed it safely on the ground, while the overjoyed dam bleated forth her thanks in a manner not to be misunderstood.

An old goose that had been for a fortnight hatching in a farmer's kitchen, was perceived, on a sudden, to be taken violently ill. She soon after left the nest, and repaired to an out-house where there was a young goose of the first year, which she brought with her into the kitchen. The young one immediately scrambled into

the old one's nest, sat, hatched, and afterwards brought up the brood. The old goose, as soon as the young one had taken her place, sat down by the side of the nest, and shortly after died. As the young goose had never entered the kitchen before, there was no way of accounting for it than by supposing that the old one had some way of communicating her thoughts and anxieties, which the other was perfectly able to understand.

TEMPERAMENT.

The temperament is the embodiment of the pervading ideas and sensations, which, receiving their stamp and force from the passions and desires of an animal, form its character. It is a permanent combination of the mental qualities peculiar to each individual, formed chiefly from the effects which circumstances and external influences have had upon it. It is sometimes called the disposition.

It follows hence that its nature cannot be changed, and that it is impossible to convert an animal to a purpose for which its disposition unfits it; and as the nature and extent of the perception, the sensation and the desire compose the temperament, and their respective powers vary in every individual, it is a natural consequence that every variation in the disposition must depend on the difference in the development of the three active elements of the mind. The temperament of animals may be divided into four main characters analogous to those in man, less marked in the lower animals and more distinct in the higher.

A weak and dim perception, a languid sensation, with no trace of the faculty of comparison, and hence no memory, belong to the *Infusoria, Polypes, Medusæ*, etc.; desire is only manifested by a faint exertion towards self-preservation and support, without other traces of action in the mind. In the *Mollusca* the mental powers, and the range of perception advance a step; sensation is more distinct and desire increases in extent, but these are chiefly confined to the calls of subsistence and of propagation, indicating in a shadowy form the power of discerning between what is agreeable or otherwise, which is especially the case with snails whose organs of appetite are particularly developed. In this class the animal consists of little else than a trunk, the head appearing only in the higher orders; the faculties of activity and motion are extremely slight, and many even remain during the whole period of their lives adhering to one spot.

We find among the articulated animals a higher range of organs, more distinct sensations and desires, with activity of motion, and the first traces of memory and intelligence.

This applies particularly to insects, whose love of activity displays itself in such numerous forms, especially in architectural contrivance and social unions.

Fishes possess a phlegmatic temperament; they are distinguished by slow perception, weak sensation, with few, and mostly simple, powers of instinct, which are chiefly called forth in the search and seizure of prey, and hence the digestive apparatus assumes a certain perfection of organism, as is manifested by the preponderance of the belly.

Toads are the emblem of melancholy. Their perception is slow, but their memory and power of comparison

possess a certain vigour, and therefore they are capable of being tamed, and even taught. They are solitary, misanthropic animals, and repulsive in aspect, partly from their appearance, and partly owing to their lurking habits, and the insidious manner in which they entrap their prey.

The sanguine temperament belongs essentially to birds, and especially to such as are songsters. Their perceptions embrace a large range, favoured by a very considerable development of the senses; their nervous and arterial organisation excited by a rapid respiration is of the highest order, and hence they possess an extreme susceptibility for all outward impressions, an intuitive perception of atmospherical and terrestrial phenomena, and an irritable sensibility; their memory and intelligence are particularly prominent. They are creatures of the air, penetrated by the element in which they move. Their whole organisation is filled with air, as the sponge with water. Their lungs, their bones, their cellular tissue, their feathers—in a word, almost every individual part, admit it into their interstices, aiding their flight, and enabling them, by their great buoyancy, to soar above the clouds, and to sport at will in the atmospheric ocean. Their architecture is more latitudinarian than that of insects, and they collect their materials from the face of nature with joyous activity. The quickness of their vision, and the rapidity of their flight, enable them to supply their young with food, and to escape their enemies with equal facility, and the very business and preservation of life only promote the sprightliness and restless activity of their natures. They delight us by their song, for neither childhood nor manhood can hear them with indifference, and they appeal to our sense of beauty by their

attractive appearance. Jerdan, in his remarks in the "Literary Gazette," on the translation of Cuvier, by Griffith, says :—"The main province, the very paradise of nature, is the birds. The gracefulness of their form, the exquisite delicacy of their covering, the inimitable brilliancy of their colours, the light and life giving transparency of the element in which they live, the singular variety of their habits, the delightful melody of their songs—these qualities make the study of birds the favourite study of every elegant mimd." They are truly *birds of the air,* for they seem to have the full command of that element; many of them moving gaily in every direction that their will suggests, rising and falling, flying backwards and forwards, or performing endless evolutions in their flight.

The choleric temperament is represented by the mammalia; their external perceptions are more distinct, their memory and judgment more pronounced, the sensations keen, more lasting and profound, and united with strong and persevering passions. Instinct with them is less prominent, and less often visible, and hence the mental powers are more extended and self-dependent.

Although these various dispositions may be considered to be peculiar to each class of animals, there are yet exceptions. The singing birds, as has been said, are of a sanguine temperament, while the marsh birds are less sprightly; their limbs are less flexible, and as their food is less easily obtained, they are less joyous, and by their more serious deportment appear to belong to the phlegmatic order. The diurnal birds of prey, are of a choleric, and the nocturnal of a melancholy, temperament. Among the mammalia, the predatory races belong to the former character; the increasing restlessness,

the anxiety for freedom and motion, and the perpetual muscular irritability remain unchanged in animals which have been confined for years. The ruminating animals, as sheep and oxen, and further, the whales, the sloths, and the swine, are of a phlegmatic temperament; their lives are mostly divided between eating and sleeping, and it is seldom that any lively sensations interrupt the monotony. Many of the *Pachiderms,* as the Elephant, the Rhinoceros, and the Hippopotamus, are of a melancholy habit; the sensation and the desire slumber long with them, like a spark among the ashes, which only kindles into flame when stirred and fanned into life. Goats, monkeys, dogs, and horses, belong to the sanguine class; they are all easily excited, and possess a lively sensation, but which soon vanishes, and even passes to the opposite extreme of humour and obstinacy. Among them, and even in the same family, the most opposite temperaments exist, as we may see daily in our horses and dogs.

CURIOSITY

Is inherent in many tribes of animals, and arises equally from an excitable and from a suspicious temperament, analogous in every respect to the characteristics which distinguish it in man, but showing itself in either playfulness, mischief, or distrust, and, though not an acquirement, is strongest in tamed or captive animals. The titmouse, released from its cage, examines every article in the room, and pries into each nook and corner; the magpie and raven, adding theft to their

inquisitiveness, are ever on the alert to make some new discovery. Most animals when they perceive a new object smell at it before they become familiarised to it, and if introduced to a new locality generally survey it with great attention.

Madlle. de Laistre described her tame weasel to Buffon as playing with her fingers like a kitten, jumping on her head and neck, and if she presented her hands at the distance of three feet, it jumped into them without ever missing. It distinguished her voice amidst twenty people, and sprang over everybody to get to her. But it was impossible to open a drawer or a box, or even to look at a paper, but he would examine it also. If she took up a paper or a book, and looked attentively at it, it ran immediately upon her hand, and surveyed with an inquisitive air whatever she happened to hold. Cowper, in speaking of his three hares, says: "These creatures have a singular sagacity in discovering the minutest alteration that is made in the place to which they are accustomed, and instantly apply their nose to the examination of a new object. A small hole being burnt in the carpet, it was mended with a patch, and that patch in a moment underwent the strictest scrutiny. They seem, too, to be very much directed by the smell in the choice of their favourites," &c.

A couple of elephants, brought to Paris, were turned into a spacious hall prepared for their reception. They entered the apartment with suspicion, reconnoitred the place, and then examined each bar separately with their trunks, and tried their solidity by shaking them, and attempting to turn the large screws on the outside which held them together. Cunning, joined with caution, an inquisitive and prying turn, and imitativeness, are the strong characters in the disposition of the whole family

of monkeys. All these faculties and propensities become more developed in a state of confinement, and, consequently, of tuition, than in their natural wildness. The oran otan of Grant carried everything to its mouth, whether eatable or not, that came in its way, examined his hands, lips, and even his teeth, and searched his pockets; and if a stranger approached it examined him with the greatest curiosity.

SAGACITY

Is the employment of the fitting means for the attainment of an object, as when animals attempt to remove difficulties, or to liberate themselves from confinement by some skilful application of their powers. Jesse relates the contrivance of a raven, which had a chain of about three feet long fastened to a ring round its neck. Whenever the bird flew or hopped about, it always gathered up the chain in its bill, to prevent the weight from hurting its neck. Captain Lyon had an arctic fox, whose tameness was so remarkable that he would not allow it to be killed, but kept it confined on the deck of his ship in a small kennel, attached to a chain. Finding itself tormented by being repeatedly dragged out by its chain, it at length took it up in its mouth whenever it retreated to its kennel, and drew it so completely in with it that it became impossible to touch a link without being bitten. A buffalo which, from its savage disposition, had its nose perforated with an iron ring, to which a chain was attached, used to pass its horn through one of the links to prevent it from

trailing on the ground, so that he could not possibly tread upon it and inflict pain on itself. Water-dogs, if urged to fetch an object thrown into the water against the stream, either wait till it floats down, or run up the banks till they are above it, before they spring in. A dog which had been delayed entering the ferry-boat at Saltash, near Devonport, swam after it, but finding that the tide swept it away, instead of persevering, it swam back, and running along the shore to some distance up the current, plunged in again, and reached the landing-place on the opposite side.

In James' "Expedition to the Rocky Mountains," mention is made of the "wonderful" sagacity of the Prairie wolves. Various schemes were resorted to in order to entrap them, but in vain. They even undermined the traps and seized the bait from beneath. Rengger describes a monkey which employed a stick to prize up the lid of a chest, to which otherwise its strength was not equal.

The sagacity of some animals enables them to comprehend the wishes of their masters, and thereby to render them essential services, and these actions in dogs and elephants are the most numerous in the annals of animals. The celebrated dog, Bungay, of Sir John Warrington, mentioned in "Warner's Illustrations," frequently was sent alone from Bath to London, carrying, in a basket slung round his neck, packages and letters; calling for refreshment at the houses in the way, which his master was accustomed to frequent, and then pursuing his journey to court, where his fidelity and sagacity assured him a hospitable reception. In one of these expeditions, Bungay, unfortunately fell into the hands of a party of beggars, who emptied his basket, carried him off, and sold him to the servants of the

Spanish ambassador, but he was afterwards recovered by his master. Among other useful offices which he was accustomed to perform, he frequently went from the manor-house at Kelwelston to Bath for two bottles of wine, which the vintner would carefully pack up in the basket suspended from his neck. One day on his return with his load, when he had only performed the half of his journey, the handle of the basket unfortunately broke, and the whole apparatus fell, of course, to the ground; but as Bungay never lost his presence of mind, he quickly discovered a method of completing the errand on which he had been sent. One of the bottles he immediately conveyed into a secret part of an adjoining hedge, and taking the other in his mouth, travelled home as fast as he could. Having delivered this, he posted back after the remaining one, which he conveyed to Kelwelston in a similar manner, and with equal safety. The concluding circumstance of the poor animal's death, bears ample testimony to his affection and sagacity, and places him on a par with the far-famed dog of Ulysses. Attending Sir John, who was on horseback, to Bath, he suddenly leaped upon the horse, with such an expression of affectionate fondness for his master, as surprised him. This he repeated three or four times successively; and immediately lay down and expired. The knight honoured his memory by having his figure introduced into the print prefixed to his translation of Orlando Furioso.

The assistance given by the Koomkies, or female decoy elephants, in taking the wild males, is doubtless the greatest proof of the sagacity of the race; for in other operations they are chiefly directed by the voice and signs of their Mahouts; but in this delicate task, the Koomkies are often allowed to proceed alone to

accomplish their treacherous errand, in which they are generally successful.

Many well-authenticated instances of sagacity are recorded in which animals have spontaneously performed actions akin to human reasoning. Sonnini mentions an elephant at Naples, which was employed with others in fetching water in a copper vessel, and perceiving that the water escaped from some fracture, he took it of his own accord to a smith's for repair, in imitation of what he had seen done before by his master. An old sporting dog on the track of wounded game, refuses its accustomed obedience to its master, knowing that it is rendering him a greater service by following his own course, than by discontinuing the pursuit.

At Bishops Stortford there were two dogs, which belonged to nobody, and lived upon the quay of the river or canal there. They took the greatest delight in rat hunting, and when the maltsters went about at night, to see that all was safe, these dogs invariably followed them. Their mode of proceeding was very ingenious. As soon as the door of the malt-house was unlocked, one rushed in and coursed round the warehouse, not chasing any rat which might start, but pursuing its way among the malt. The other stood at the door and snapped at the rats as they endeavoured to escape. The one standing at the door was known to kill six rats, all of which had rushed to the door at the same time. The next room they came to, they would change posts; the one which hunted before, now standing at the door and seizing the prey. By this means the dogs killed in the malting-houses of one maltster alone, upwards of 2000 rats in the course of one year. One of them on one occasion killed sixty-

seven in less than five minutes. They seemed to pursue the sport simply for their amusement.

The ass is always esteemed as the stupidest of animals, yet if one be shut up in the same enclosure with half-a-dozen horses of the finest blood, and the party escape, it is infallibly the poor donkey that has led the way. It is he alone that penetrates the secret of the bolt and latch, and he may be often seen snuffing over a piece of work, to which all other animals are incompetent.

In a cage at the Zoological Gardens in Regent's Park, two ravens were confined. Two pieces of bread were thrown to them, when one of them jumped immediately from his perch, and before his comrade could reach either of them, he had both secure in his beak, and regained his former position on the perch, holding them until he saw his comrade at the further end of the cage. He then flew down, buried one of the pieces, and covered it with gravel, and jumping up to his perch with the other piece, devoured it. He then jumped down for the second morsel, and regaining his perch a second time, consumed that, much to the annoyance of his companion.

As the game-keeper of Lord Lowther in Ravenstonedale, was ranging the fields with his gun, he observed a hawk hovering near him; and whilst preparing to give it a shot, a fieldfare flew in terror against his breast, and then perched upon his shoulder. He fired at the hawk with the first barrel (while the fieldfare sat still), but missed; the hawk, intent upon its prey, disregarded the shot; with the second barrel he brought the bird down. The fieldfare left his shoulder, and fluttered for a short time round its dead enemy, uttering a chirp of joy, and then flew off with confidence.

An elephant belonging to Mr. Boddam of the Bengal civil service, at Gyah, used every day to pass over a small bridge leading from his master's house into the town of Gyah; he one day refused to go over it, and it was with great difficulty, by goring him most cruelly with the Hunkuss (an iron instrument), that the Mahout could get him to venture on the bridge, the strength of which he first tried with his trunk, showing clearly that he suspected that it was not sufficiently strong; at last he went on, and before he could get over, the bridge gave way, and they were precipitated into the ditch, which killed the driver and considerably injured the elephant. It is reasonable to suppose that the elephant must have perceived its feeble state when he last passed over it. It is a well-known fact that elephants will seldom or ever go over strange bridges, without first trying with their trunks whether they be sufficiently strong to bear their weight,—nor will they ever go into a boat without doing the same.

Mr. Johnson, in his "Field Sports of India," says that he once had a remarkably quiet and docile elephant, which one day came home loaded with branches of trees for provender, followed by a number of villagers, calling for mercy (their usual cry when ill used), complaining that the Mahout had stolen a kid from them, and that it was then on the elephant, under the branches of the trees. The Mahout took an opportunity of decamping into the village and of hiding himself. Mr Johnson ordered the elephant to be unloaded, and was surprised to see that he would not allow any person to come near him, when at all other times he was perfectly tractable and obedient. Combining all the circumstances, he was convinced that the Mahout was guilty, and to get rid of the noise he recompensed the

people for the loss of their kid. As soon as they were gone away, the elephant allowed himself to be unloaded, and the kid was found under the branches, as described by the people. He learned from his *Sarcar* that similar complaints had been made to him before, and that the rascal of a Mahout made it a practice to ride the elephant into the midst of a herd of goats, and had taught him to pick up any of the young goats he directed; he had also accustomed him to steal their pumpions and other vegetables that grew against the inside of their fences, like French beans, which could only be reached by an elephant.

A person from the Hague relates the following instance of canine sagacity, hardly a degree behind the famous story of the Dog of Montargis. An individual driving his cabriólet in the environs of that town, having approached a lonely farm-house, was arrested by the piercing cries of a child. He hastily alighted and sought to discover their cause; when a little girl about three years of age, bathed in tears and accompanied by a dog, presented herself before him. No other living creature could be seen in the house; the stranger called, but no answer was returned; and after a vain search, he took the helpless infant along with him, and drove to the nearest tavern followed by the dog. Entering the common room, he observed two ill-looking characters in a corner together, one of whom, not aware of committing himself with a stranger, said to his fellow, "That, I believe, is the cursed dog that gave us so much trouble yesterday." The moment the animal heard his voice, he sprung at the speaker, and fastened upon him so firmly that nothing could relax his hold. This extraordinary circumstance roused the suspicions of the child's protector, and he had the men arrested.

Providence was in the act, for they confessed the murder of the poor girl's father and mother, and of their servant, having spared only the infant, as being too young to detect their villany.

The late Sir Robert Kerr Porter, in his "Travels in Persia," relates an instance of uncommon sagacity in a greyhound; that sort of dog not being in general celebrated for anything besides fleetness in the chase. Soon after he had advanced into the uneven country, by some negligence or other, the horse-keeper allowed a fine spirited animal to break away. The horse set off at speed up the hills; and from the darkness of the night, and the few people he could spare to pursue, he at first despaired of his recovery. But the dog, on the instant he perceived the animal loose, headed him at every turn, and at length, after a long run, succeeded in catching the end of the halter, and in retaining it in his mouth, holding it firm, while the superior strength of the horse dragged him onward; and then pulling him in his turn, he endeavoured to arrest the fugitive's pace, during his bounds and sudden freaks; which effort of the dog's so far impeded the animal's flight, as, at last, to allow one of the servants to seize him.

Great as is the sagacity of the shepherds' dogs in the southern and midland counties of England, yet it falls far short of that of the collie dog in the northern counties and in Scotland. In the calamities of storm and flood, they have shown an intelligence and independence of action which could not possibly have been the result of education, but have been marked rather as the voluntary and spontaneous efforts, which, humanly speaking, would proceed from a person desirous of showing his determination to carry out, and

even to anticipate, the trust reposed in him. Under the circumstances in which they are placed, the wide extent of the pasturage of the flocks under their charge, and the various duties entrusted to them, it is evident that they acquire a superior degree of intelligence, and a sharpness of sagacity which render them equal to any emergency. A recent number of the "Glasgow Post" relates the following tale:—"A few days ago, Hector Macalister, while on the Arran Hills looking after his sheep, six miles from home or other habitation, his two collie dogs started a rabbit, which ran under a large block of granite. He thrust his arm under the stone, expecting to catch it, but instead of doing so he removed the supports of the block, which instantly came down on his arm, holding him as fast as a vice. His pain was great, but the pangs he felt when he thought of home and the death he seemed doomed to die, were greater. In this position he lay from ten in the morning until four in the afternoon, when, finding that all his efforts to extricate himself were unavailing, he tried several times, without effect, to get his knife out of his pocket to cut off his arm. His only chance now was to endeavour to send home his dogs, with the view of alarming his friends. After much difficulty, as the creatures were most unwilling to leave him, he succeeded; and Mrs. Macalister, seeing them returning alone, took the alarm, and, collecting the neighbours, went in search of her husband, led on by the faithful collies. When they came to the spot, Macalister was in a very exhausted state, and quite speechless with crying for assistance. It required five strong men to remove the block from his arm." A further instance of reason and self-judgment was shown in the collie, which

having to collect some sheep from the sides of a gorge, through which ran a morass, saw one of the animals precipitate itself into the shifting moss, where it sank immediately up to the neck, leaving nothing but its small black head visible. The dog looked at the sheep and then at its master with an embarrassed, what shall I do, kind of expression; but the latter being too far off to notice the difficulty or to assist, the dog, with infinite address, seized the struggling animal by the neck and dragged it by main force to the dry land, and then compelled it to join the flock he was collecting.

PRECAUTION—FORESIGHT.

This is abundantly prominent in all animals, and arises either from intuitive suspicion or from the recollection of dangers incurred under analogous circumstances. It is entirely confined to the great principle of self-preservation, whether as regards life or the fear of pain and injury. Thus, birds which have once been snared are seldom caught a second time, and the fox and martin, suspecting danger, examine the trap laid for them, and though attracted by the bait, rarely, in comparison, fall victims to their cupidity: the former watches his opportunity to plunder, and in order to ensure his flight, and to ascertain that the ground be clear, he sneaks round the spot of his intended depredations, and moves stealthily along, remaining motionless at the least noise, and acts with the greatest circumspection.

Most creatures in a state of nature will allow of the

near approach of persons from whom no danger is to be apprehended, but fly at the sight of a sportsman or a dog. Rooks, which are most difficult of approach by a man with a gun, follow the plough so closely as to be within reach of a long stick. Seals found on any new or unfrequented land, and unused to the sight of man, exhibit no signs of fear, but soon become suspicious, and never bask on the rocks in shoals without placing a sentinel, and ensuring their safety by the most vigilant precautions. Birds which frequent solitary spots are far less timid than those which are frequently disturbed.

Brehm relates an instance of the instinctive caution of a pewet. He had placed some snares of horse-hair over its nest, and the bird having alighted at the distance of thirty paces, ran to it, and, seeing them, pushed them aside with her bill. The next day he set them thickly around the nest, but the bird, instead of running as usual to it, alighted directly upon it. This bird has an instinctive dread of a man carrying a gun, but permits a person empty-handed to approach it. Naumann says that bustards, which are numerous in Hungary, are little disturbed by persons who pay no attention to them, as peasants attending their cattle, and that to get within shot of them it is necessary to dress as a peasant or to lie concealed in an ordinary peasant's cart.

A monkey, which had once cut itself with a knife, could on no account be induced to touch another; and the same animal having been stung by a wasp, which was given to it wrapped up in paper, instead of a bonbon, never received a bit of paper afterwards without carrying it to his ear, and shaking it to ascertain if there was any motion inside, before he would open it.

In the year 1783, two cats belonging to a merchant at Messina announced to him the approach of an earthquake. Before the first shock was felt, these two animals seemed anxiously to work their way through the door of a room in which they were. Their master, observing their fruitless efforts, opened the door for them. At a second and third door, which they likewise found shut, they repeated their efforts, and, on being set at liberty, they ran straight through the street, and out of the gate of the town. The merchant, whose curiosity was excited by this strange conduct of the cats, followed them into the fields, where he saw them scratching and trying to conceal themselves in the earth. Soon after there was a violent shock of an earthquake, and many of the houses of the city fell down, among which was that of the merchant, who was thus indebted for his life to the singular foresight of his cats.

Most animals and birds and even insects have a prescience of the coming storm. The sea-birds fly homewards for safety and shelter; bees refuse to wander abroad; some fish, as has been before stated, rise to the surface and become more lively, while others seek the deep waters. But fish are not endowed altogether with precaution, beyond securing their safety by flight when alarmed.

In a humorous letter published some years ago, superscribed "The Shade of Izaak Walton to the Fishes of the Thames," the following anecdote is given: "I will tell you a pleasant story—it happened to myself, as I once sat on a bank a fishing:—A certain wicked perch, that had a design upon my bait, (for, as I have already told, fishes do not bite to please anglers, but to please themselves) was approaching thereto, when,

suddenly pulling my line out of the water, I caught him (which made me very sorry) by his very eye, which came, to my real grief, clean out of his head; and in this my grief, I think I was to the full as sincere as they that make, as it were, a trade of sorrow. But for this fish, I thought him to be like those soldiers or sailors, that having become maimed, whether in a good or a bad cause, did deserve a relief from all future wars, so I quickly returned him to his natural element, there to abide his chance to meet no more with hook or line;—but mark my wonder, when returning my thus ready-baited hook to the water, and with this so singular bait, (i.e. his own eye) I caught, the next minute, the self-same perch, who thus became so like a phenomenon, that he had one eye in his belly and the other in his head," &c.

When the cholera broke out with frightful severity at St. Petersburg in July, 1848, the crows, which are extremely abundant in that city, and settle familiarly in the streets, forsook it, and returned as soon as the virulence of the disease ceased.

A short time since a very fine old ash tree stood in the garden of the vicarage at Newcastle, which had been for many years the haunt of a colony of rooks, whose nests crowded the branches. In each succeeding year they returned for the purpose of nidification, till at last their numbers suddenly decreased, while a few lingered on as if reluctant to leave the favourite spot, commencing their labours for one or two successive seasons, but without completing their task, and these finally transferred themselves entirely to another locality, and abandoned the old tree. Unknown to all, the tree had decayed at the root, and shortly afterwards fell before the violence of a severe gale.

CUNNING, ARTIFICE, AND DISSIMULATION.

THESE qualities are common to all animals in some respects, but in others belong almost peculiarly to certain families and species. They originate from one or other of the three great leading principles of animal life,—self-preservation, the means of subsistence, and the care of the young. The devices and stratagems which are had recourse to in any of these emergencies or wants, indicate strong powers of intelligence, judgment, and self-command. They are either employed to conceal, or to perform slily, such actions, which might otherwise be prevented, or from an exposure of which some injury might result; or they are used for the purpose of misleading and deceiving enemies and pursuers; or to gain some object by feigned indifference, and even by counterfeiting death.

All the smaller birds, and others which build on the ground, when returning to their nests alight at some little distance, and approach them covertly and with the greatest circumspection, besides constructing them either in the most hidden recess, or of materials assimilating to the colours of the surrounding objects. The larger birds, whose flight is higher, are not without their precautions, as, like the eagle, they cast a searching glance around them to know that their sanctuaries are unmolested, and that no ambush is laid for them. Audubon, anxious to learn the habits of the eagle, which he has named "the Bird of Washington," seated himself about a hundred yards from the rock on which

the nest was situated, to watch the old birds. He says: "Two long hours had elapsed before the old bird made his appearance, which was announced to us by the loud hissings of the two young ones, which crawled to the extremity of the hole to receive a fine fish. I had a perfect view of this noble bird, as he held himself to the edging rock, hanging like the swallow, his tail spread, and his wings partly so. I trembled lest a word should escape from my companions — the slightest murmur had been treason from them. They entered into my feelings, and, though little interested, gazed with me. In a few minutes the other parent joined her mate, and from the difference of size (the female of rapacious birds being much larger) we knew this to be the mother bird. She also had brought a fish; but more cautious than her mate, she glanced her quick and piercing eye around, and instantly perceived that her abode had been discovered. She dropped her prey, a white perch weighing 5½ lbs., with a loud shriek communicated the alarm to the male, and hovering with him over our heads, kept up a growling cry, to intimidate us from our suspected design.

Great address and cunning is observed in the concealment of food. The fox, if he be unable to carry off the whole of his spoil from a hen-roost, buries it, and returns for it on the following night. Le Vaillant's monkey, which held a conspicuous place in his caravan, was often employed by him to search for roots, and if not closely watched, either eat them in the greatest haste, or, being disturbed, concealed them for a future opportunity.

Steller, the Russian traveller, says that during his abode on Behring's Island, the arctic foxes were the plague of his life by their impudence, cunning, and

roguery. Among other feats, if the sea threw up an animal of any kind, they devoured it before it could be rescued from them; and if they could not consume the whole at once, they trailed it in portions to the mountains, where they buried it under stones before the eyes of himself and his party, running to and fro as long as anything remained to be conveyed away. While this was doing, others stood on the guard and watched. If they saw any one coming at a distance, the whole troop would combine at once, and begin digging in the sand, till even a beaver or a sea-bear in their possession would be so completely buried under the surface, that not a trace of it could be seen.

The common fox exhibits a great degree of cunning in digging young rabbits from their burrow. He does not enter the hole, for in that case he would have to dig several feet along the ground, under the surface of the earth; but he follows their scent above, till he comes to the end, where they lie; and then scratching up the earth, descends immediately upon and devours them. If pursued, he generally makes towards his kennel, and if his retreat be cut off, his stratagems and shifts to escape are as surprising as they are various. He takes to the woody parts of the country, and prefers the paths that are most embarrassed with thorns and briars. He runs in a direct line before the hounds, and at no great distance before them; and, if hard pushed, seeks the low, wet grounds, running down the wind, as though conscious that the scent does not lie so well there. There is not a hunt in the kingdom that has not some remarkable instance of this animal's cunning to relate. He has also been known to counterfeit death as a means of escape. This degree of cunning has been noticed in the wolf. Capt. Lyon relates such

a circumstance in his private journal of the Polar expedition: "A wolf was caught in a trap, set by Mr. Griffiths, and after being to all appearance killed, was in that state dragged on board. The eyes, however, as it lay on the deck, were observed to wink, whenever any object was placed near them: some precautions were therefore considered necessary; and the legs being tied, the animal was hoisted up with his head downwards. He then, to our surprise, made a vigorous spring at those near him; and afterwards repeatedly turned himself upwards, so as to reach the rope by which he was suspended, endeavouring to gnaw it asunder, and making angry snaps at the persons who prevented him. Several heavy blows were struck on the back of his neck, and a bayonet was put through him, yet above a quarter of an hour elapsed before he died; having completely convinced us that for the future, we should not too easily trust to the appearance of death in animals of this description."

In intellect the quadrumanous animals are not superior, and in many cases inferior, to others of the brute creation. But among the many anecdotes related of the understanding of the oran otan, and other monkeys, some may be classed as under the influence of a higher power of discrimination than mere instinct, and where a process, as it were, of discussion passed in the sensorium of the animal. An oran otan one day received half an orange, a fruit of which he was passionately fond, the other half being laid aside upon the upper shelf of a press, out of his reach and sight. Sometime after, his keeper having extended himself on a sofa, with his eyes closed, the oran otan began to prowl about the room, and showed that, notwithstanding his apparent inattention, the position of the favourite orange

had been narrowly watched. Anxious to see the result, the keeper continued quiet, and feigned sleep. The animal cautiously approached the sofa, examined as far as he could that his guardian was asleep, and mounting quietly and expeditiously, finished the remaining half of the orange, carefully concealing the peel in the grate among some paper shavings, and having again examined his keeper, and seeing nothing doubtful in the reality of his sleep, retired confidently to his own couch. Here must have been a detailed series of impressions during the progress of the action; but in common with the construction of the brute mind, he was incapable of extending the power farther, or of reasoning upon that action, during the performance of which his intellect had gone through several distinct processes. All their actions, in a state of confinement, may be traced to the same source, while those in a state of nature will be more akin to instinct, and will be performed under the impulse of the various passions.

The following anecdote occurs in the "Oriental Annual:" In the jungles about Tillicherry, there is a large species of monkey, frequently tamed by the natives, and at a village a short distance from this celebrated sea-port, we had an evidence of the remarkable sagacity of this animal. A few yards from the house of the person to whom it belonged, a thick pole, at least thirty feet high, had been fixed into the earth, round which was an iron ring, and to this was attached a strong chain of considerable length, fastened to a band round the monkey's body. The ring being loose, it slid along the pole when he ascended or descended. He was in the habit of taking his station at the top of the bamboo, where he perched, as if to enjoy the beauties of the prospect around him. The crows, which

in India are very abundant, and singularly audacious, taking advantage of his elevated position, had been in the habit of robbing him of his food, which was placed every morning and evening at the foot of the pole. To this he had vainly expressed his dislike by chattering, and other indications of his displeasure, equally ineffectual; but they continued their periodical depredations. Finding that he was perfectly unheeded, he adopted a plan of retribution, as effectual as it was ingenious. One morning, when his tormentors had been particularly troublesome, he appeared as if seriously indisposed; he closed his eyes, dropped his head, and exhibited various other symptoms of severe suffering. No sooner were his ordinary rations placed at the foot of the bamboo, than the crows, watching their opportunity, descended in great numbers, and, according to their usual practice, began to demolish his provisions. The monkey began now to descend the pole by slow degrees, as if the effort were painful to him, and as if so overcome by indisposition, that his remaining strength was scarcely equal to such an exertion. When he reached the ground, he rolled about for some time, seeming in great agony, until he found himself close by the vessel employed to contain his food, which the crows had by this time well-nigh devoured. There was still, however, some remaining, which a solitary bird, emboldened by the apparent indisposition of the monkey, advanced to seize. The wily creature was at this time lying in a state of apparent insensibility at the foot of the pole, and close by the pan. The moment the crow stretched out his head, and ere it could secure a mouthful of the interdicted food, the watchful avenger seized the depredator by the neck, with the rapidity of thought, and secured it from doing further mischief.

He now began to chatter and to grin with every expression of gratified triumph, while the crows flew around, cawing, as if deprecating the chastisement about to be inflicted on their captive companion. The monkey continued for a while to chatter and grin in triumph; he then deliberately placed the crow between his knees, and began to pluck it with the most humorous gravity. When he had completely stripped it, except of the large feathers in the pinions and tail, he flung it into the air as high as his strength would permit, and, after flapping its wings for a few seconds, it fell to the ground with a stunning shock. The other crows, which had been fortunate enough to escape a similar castigation, now surrounded it, and immediately pecked it to death. The animal then ascended its pole, and the next time his food was brought, not a single crow approached it.

Many animals, especially birds, as mentioned in page 283, exhibit a remarkable degree of address and artifice in misleading and withdrawing intruders from their young, and in cases of self-preservation they are not deficient in judgment. The hare, when hard pressed, doubles repeatedly upon her pursuers, and, as if conscious of the trail which guides them, breaks the scent by leaping from a considerable distance into her form, or drives another hare from its seat, which she immediately occupies, or even seeks refuge in a flock of sheep.

Intelligence can probably attain no higher grade than when one animal circumvents the cunning of another by an artifice of its own, as in the case of the dog, which, having several times chased a rabbit and lost it, by its seeking shelter in its burrow, at last on a future occasion suddenly gave up the pursuit, and ran straight

to the burrow to anticipate the arrival of the rabbit, which he caught as it entered.

A *tope* or grove, adjoining Bangalore, is a perfect metropolis of monkeys. They swarm in thousands, chasing each other on the roads, capering on the edges, chattering on the boughs, and grinning hungrily at any one who passes by with any eatables. They are a constant pest to every housewife in the town; discovering unsuspected passages to their stores, forestalling the meal, and making a hasty retreat. A native fable, illustrating the danger of mischievous companions, tells of a man who went a journey accompanied by his monkey and his goat, taking with him rice and curds for refreshment by the way. Arrived at a tank, he resolved to bathe and dine. Laying down the bundle with provisions, he tied the two animals to a bush, and went down to the tank. No sooner had he disappeared, than the monkey took the bundle, untied it, disposed of the good things, and then wiping his paws on the beard of the goat so as to leave plenty of marks, sat down solemnly on the other side of the tree. The poor goat suffered the beating due to her arch companion.

A sportsman had a corncrake brought to him by his dog, to all appearance dead. As it lay on the ground, he turned it over with his foot, convinced that it was dead. Standing by, however, some time in silence, he suddenly saw it open an eye. He then took it up —its head fell, its legs hung loose, it appeared again totally dead. He then put it in his pocket, and before very long he felt it all alive, and struggling to escape. He then laid it on the ground and retired to some distance; in about five minutes it warily raised its head, looked round, and decamped at full speed.

ATTACHMENT.

Active intelligence, proceeding from the emotions of sympathy or impulse, shows itself in the forms of attachment, gratitude and generosity; and as jealousy, hatred and revenge, when it is awakened by antipathy.

The attachment of animals to their own species has been mentioned in a former place, and instances are most abundant of their showing the warmest affection not only to man in return for favours and kindnesses received, but also to other animals of different species, and of opposite habits to their own. Naumann relates an instance of a crane, which having lost its mate, continued moping and solitary for a considerable time, and at last attached itself to an ox, from which it became inseparable, following it to pasture and roosting beside it in its stall. Lions and tigers have been known to spare the lives of such creatures as have been thrown into their cages to be devoured by them, to live peaceably with them, to afford them part of their subsistence, and sometimes even to want food themselves rather than take the lives their generosity had spared. A dog was put into the cage of a lion in the late menagerie at the Tower some years ago, for his food. The noble animal, however, spared its life; and they lived together for a considerable time in the same den in the most perfect harmony. The dog had sometimes the impudence to growl at the lion, and even to dispute with him the food which was thrown to them, but the lion was never known to chastise the impertinent conduct of his little companion, and usually suffered it to eat quietly till it was satisfied, before he began his own repast. A lioness

in the Jardin des Plantes in Paris permits a dog to live in her den, and is excessively fond of it. She seems both pleased and gratified by its caresses, is attentive to all its wants, and is unhappy when it is removed from her sight, though for a few moments only.

A remarkably fine tiger, which was kept for many years in the Tower, allowed a little terrier to be introduced into its den, and became so much attached to it, as to be restless and unhappy whenever the animal was taken away to be fed. On its return the tiger invariably expressed the greatest symptoms of pleasure and delight, always welcoming its arrival by gently licking over every part of its body. In one or two instances the dog was left in the den by mistake, during the time the tiger had his food. The dog sometimes ventured to eat with him, but seldom without his appearing dissatisfied with the liberty. Horses become extremely attached to dogs and even to cats, and seem pleased to have them on their backs in their stables. Rengger mentions a monkey which was so fond of a dog that it cried during its absence, and caressed it on its return, and assisted it in its quarrels with other dogs. A peccari in the menagerie in Paris formed a strong friendship with one of the keeper's dogs; and a seal in the same place allowed a little water-dog to play with it, and to take fish from its mouth, which it always resented if attempted by the other seals in the same tank. Dogs have lived in friendship with geese and ravens, and cats with small birds, and dogs and cats are frequently attached to one another. Winckell speaks of an otter that was brought up with a terrier, following it everywhere, and inviting it to gambol with him.

The attachment of animals to man is one of the most pleasing and attractive traits in their characters: it is

not confined to domestic ones alone, but extends to the most ferocious, as the lion and tiger, and to the most suspicious, as the fox and the martin. A rat has been known to accompany its master in his walks, to fly to him for safety at the least alarm, and to shun the presence of strangers. Instances of strong attachment are met with frequently in birds, as parrots, geese, bullfinches, the starling and rook tribes, and in the trumpeter bird of America. This bird, when tamed, distinguishes its master and benefactor with marks of affection. "Having," says Vosmaër, "reared one myself, I had an opportunity of experiencing this. When I opened its cage in the morning, the kind animal hopped round me, expanding his wings, and *trumpeting*, as if to wish me good morning. He showed equal attention when I went out and returned. No sooner did he perceive me at a distance, than he ran to meet me; and even when I happened to be in a boat, and set my foot on shore, he welcomed me with the same compliments, which he reserved for me alone, and never bestowed upon others."

Among domestic animals the attachment of the cat is, with few exceptions, fixed on the locality rather than on the person, while that of the horse and dog is entirely of a personal character. The horses of the Arab, and of other nomad people, who bestow the greatest attention and kindness on them, are devotedly attached to their master. To the Arabs they are as dear as their own children; and the constant intercourse, arising from living in the same tent with their owner and family, creates a familiarity that could not otherwise be effected, and a tractability that arises from the kindest usage. The gentle animals suffer the children to rest on their bodies and necks without in the least

incommoding them, and seem afraid to move lest they should hurt them.* The whole stock of a poor Arabian of the desert consisted of a mare of matchless beauty and of the purest blood: this the French Consul at Saïd offered to purchase, with the intention of sending her to France. The Arab, pressed by want, hesitated for a long time, but at length consented, on condition of receiving a very considerable sum of money, which he named. The man, so poor as to possess only a miserable rag to cover his body, brought his magnificent courser. He dismounted, and, looking first at his gold, and then steadfastly at his mare, heaved a deep sigh. "To whom is it," he exclaimed, "that I am going to yield thee up? To Europeans! who will tie thee close —who will beat thee—who will render thee miserable! Return with me, my beauty! my jewel! and rejoice the hearts of my children!" As he pronounced these last words, he sprang upon her back, and was out of sight almost in a moment.

Soldiers' horses are frequently much attached to their riders, who bestow great attention on them. This is particularly the case in the field, where the man is in bivouac or employed on service at the advanced posts, and occupies himself particularly with his horse to assist the monotony of his time.

The attachment of the dog is, however, far greater, and his fidelity has grown into a proverb. He gives a preference to human society, following his master everywhere, and, like man, he is spread over every zone and climate. It is by means of the keenness of this attachment that he accustoms himself to every change and circumstance, and allows himself to be trained to every purpose, as watch-dog, as guardian, for the chase, for

* Bingley.

draught, and, on the St. Bernard he is the zealous assistant of the monks in rescuing the benighted and snow-covered traveller. His fidelity and affection are unshaken even under the cruellest treatment of blows and starvation, and the death of his master hardly severs the bond of attachment, of which many affecting anecdotes are on record. In the parish of St. Olave, in Tooley Street, London, the churchyard is detached from the church, and surrounded with high buildings, so as to be wholly inaccessible but by one large close gate. A poor tailor of this parish, dying, left a small cur-dog inconsolable for his loss. The little animal would not leave his dead master, even for food; and whatever he ate was obliged to be put in the same room with the coffin. When the body was removed for burial, this faithful attendant followed his master's remains. After the funeral he was hunted out of the churchyard by the sexton. The next day he again found the animal, which had made its way, by some unaccountable means, into the inclosure, and had dug himself a bed on the grave of his master. Once more he was hunted out; and again he was found in the same situation on the following day. The minister of the parish, hearing of the circumstance, had him caught, taken home and fed, and used every endeavour to win the animal's affections; but they were inseparably wedded to his late master, and he took the first opportunity to escape, and regain his lonely situation. With true benevolence, the worthy clergyman permitted him to follow the bent of his inclinations; but to soften the rigour of his fate, he caused a small kennel to be built on the grave, which was replenished once a day with food and water. Two years did this pattern of fidelity pass in this manner, till death put an end to his griefs.

Instances of canine affection may be adduced to fill a volume, and they are as generally known as household tales; but to turn to a less sagacious animal, the ass, the following anecdote was reported sometime since in the "Kelso Mail," and the recital of it may tend in some degree to redeem the ill-used race from a portion of the *load* of stupidity which is generally assigned to them, and which, with so many other loads, they bear with such exemplary patience: "Thomas Brown, residing near Hawick, travels the country as higgler, having an ass, the partner of his trade. From suffering under a paralytic affection, he is in the habit of assisting himself on the road by keeping hold of the crupper of the saddle, or more frequently of the tail of the ass. During a recent severe winter, whilst on one of his journeys near Rule Water, the old man and his ass were suddenly plunged into a wreath of snow. There they lay long, far from help, and ready to perish,—at length the poor ass, after a severe struggle, got out, but finding his unfortunate master absent, he eyed the wreath for some time with a wistful look, and at last forced his way through to where his master lay, when placing his body in such a position as to afford a firm grasp of the tail, the honest higgler was thereby enabled to take his accustomed hold, and was actually dragged out by the faithful beast to a place of safety."

Sterne, in his "Sentimental Journey," has sketched an affecting incident of the man mourning for his dead ass: "The ass, he said, he was assured, loved him; and upon this, he told them a long story of a mischance upon their passage over the Pyrenean mountains, which had separated them from each other three days, during which time the ass had sought him as much as he had

sought the ass, and that they had scarce either eat or drank till they met."

The "Singapore Free Press" of the present year relates the following instance of courage, sagacity, and attachment in the buffalo: "In the month of March last, an occurrence took place in the division Modjokerto (residence of Sourabaya) which furnishes a striking proof of the attachment of animals towards their purveyors; and as the local authorities inquired into the truth of the facts, there cannot be the least doubt on the matter. A boy eight years of age, in the Dessa Gilang, was herding some buffaloes in a wood not very distant from the village, when he was unexpectedly seized and dragged away by a tiger. At the cries of anguish uttered by the boy, two buffaloes immediately came running up, one of which attacked the tiger with such success that he released the boy and seized the buffalo above the knee-joint, on which a fight ensued between the buffalo and the tiger, which ended in the flight of the latter. In the meantime the other buffalo had placed himself above the body of the boy, which was lying on the ground, in such a way as to cover it entirely, and protect it against a second attack of the tiger. The people of the neighbouring Dessa had in the meantime armed themselves, pursued and killed the tiger. The life of the boy, although he was severely wounded by the tiger, was not despaired of. The peculiar attachment which the two buffaloes, in this case, showed towards their keeper, is explained by the circumstances that for the most part the young natives, who take care of the pasturage of these animals, bestow extraordinary attention on one or more of their herd, that they generally remain in their vicinity, and sometimes pass a large portion of the day on their backs."

Johnson, in his "Field Sports of India," relates another and more fatal circumstance. He says: "Two *Biparies* (dealers in grain) were driving a string of loaded bullocks to Chittrah, from Palamow; when they were come within a few miles of the former place, a tiger seized on the man in the rear, which was seen by a *Guallah* (herdsman), as he was watching his buffaloes grazing. He boldly ran to the man's assistance, and cut the tiger severely with his sword; upon which he dropped the *Biparie* and seized the herdsman; the buffaloes observing it, attacked the tiger, and rescued the poor man; they tossed him about from one to the other, and killed him. The *Biparie* recovered, but the herdsman died."

Of all animals, with whose history and manners we are properly acquainted, the elephant is most remarkable for docility and attachment. He loves his keeper, and distinguishes the tones of command, of anger, and of approbation, and regulates his actions by his perceptions. His attachment and affection are sometimes so strong and durable, that he has been known to die of grief, when in an unguarded fit of rage he has killed his keeper. He is more easily tamed by mildness than by blows. He is proud and ambitious, yet so grateful for good usage, that he has been known to bow the head in passing houses where he had been hospitably received. Elephants are remarkably fond of children, and seem to discern the innocence of their manners. They often allow themselves to be led and commanded by a child, and sometimes act as its keeper. Dr. Darwin states that it is not uncommon for the keeper of an elephant in his journey in India, to leave him fixed to the ground by a length of chain, when he goes into the woods to collect food for him, with a child yet

unable to walk, under his protection; and the affectionate animal not only defends it, but as the child creeps about, when it arrives at the extremity of the chain, he wraps his trunk gently round its body, and brings it again into the centre of his circle.

FIDELITY, GRATITUDE.

These which would be styled virtues in man, are little less so in animals—they are the offspring of, and akin to, attachment. We have seen how dogs defend their master, and submit to brutalities, and even death, for his sake. This faithful and all-engrossing attention extends to everything which belongs to him, which they watch and defend, and exert themselves to recover if stolen, becoming even the instruments of detecting the thieves. One instance we have quoted, but many others exist where they have pined away after the death of their masters and benefactors, and refusing food, have expired on their graves.

These qualities are necessarily the result of domestication or of intercourse with man, proving, as regards wild animals in a captive state, that they are inherent though dormant passions, a shadow of the original gentleness of their kinds, before the face of nature was changed, and of the general harmony that shall again prevail.

Many familiar proofs exist of the gratitude and attachment of the lion even, as in the well-known cases of Androcles, of Gottfried de la Tour, and of Duke William of Austria, whose lion followed him everywhere, and refusing all food after his death, survived only a few days.

Similar acts of devotion are recorded of other descriptions of animals; a young roe died after it was separated from the lady who had reared it. The mouse which had been tamed by Baron Trenck in his prison, having been taken from him, watched at the door and crept in when it was opened, and being removed again, and confined in a cage, refused all food and died in three days. Cats also, which generally seem incapable of personal attachment, have given remarkable proofs of it on the decease of their benefactors. Lord Southampton's cat traced him to his place of confinement in the Tower, and descended the chimney to gain access to him. A young rat, which a prisoner at Genf had tamed, so that it would crawl into his bosom and lie for hours, having been punished by him for some fault, made its escape, but returned at the expiration of a month, and renewed its familiarity; but on the prisoner being released, it abstained from food, and was found dead at the end of three days among some clothes which its friend had left behind. One of Cowper's three hares was ill for three days, during which time he nursed it, keeping it apart from its two comrades, that they might not molest it, and by constant care restored it to health. No creature could be more grateful, he says, than his patient after its recovery; a sentiment it most significantly expressed by licking his hand, first the back of it, then the palm, then each finger separately, as if anxious to leave no part of it unsaluted, a ceremony which it never performed but once again on a similar occasion. A surgeon at Dover, seeing a terrier dog in the street, which had received some injury, took it home, and after having cured it in a couple of days let it go, and for many weeks the animal used to pay him a daily visit of a few minutes, and after a vehement

wagging of his tail, scampered off again to his own home.

There are many touching instances of mutual fidelity and attachment in animals towards each other, particularly if they have been long associates. Of two horses attached to the same cannon in the German Artillery brigade, which served in Spain against the French, one was shot, and the other, which could not be induced to feed, died shortly afterwards; and a dog which had inhabited the same cage with a lioness for several years, pined away after her death, and died on the seventh day.

Bingley relates an affecting story of the Guinea parrot (*Psittacus pullarius*); after stating that these birds are exceedingly kind and affectionate towards each other, he says: A male and female of this species were lodged together in a large square cage. The vessel which held their food was placed at the bottom. The male usually sat on the same perch with the female and close beside her. Whenever one descended for food, the other always followed; and when their hunger was satisfied, they returned together to the highest perch of the cage. They passed four years together in this state of confinement, and from their mutual attention and satisfaction, it was evident that a strong affection for each other had been excited. At the end of this period the female fell into a state of languor, which had every symptom of old age; her legs swelled, and knots appeared upon them, as if the disease had been of the nature of the gout. It was no longer possible for her to descend and take her food as formerly; but the male assiduously brought it to her, carrying it in his bill, and delivering it into hers. He continued to feed her in this manner with the utmost

vigilance for four entire months. The infirmities of his mate, however, increased every day; and at length she became no longer able to sit upon the perch; she remained now crouched at the bottom, and from time to time made a few useless efforts to regain the lower perch, while the male, who remained close by her, seconded these her feeble attempts with all his power; Sometimes he seized with his bill the upper part of her wing, to try to draw her up to him; sometimes he took hold of her bill and attempted to raise her up, repeating his efforts for that purpose several times. His countenance, his gestures, his continual solicitude, everything in short, indicated in this affectionate bird an ardent desire to aid the weakness of his companion, and to alleviate her sufferings. But the scene became still more interesting when the female was on the point of expiring. Her unfortunate partner went round and round her without ceasing; he redoubled his assiduities and his tender cares; he attempted to open her bill in order to give her some nourishment; his emotion every instant increased; he went to her, and returned with the most agitated air, and with the utmost inquietude; at intervals he uttered the most plaintive cries; at other times, with his eyes fixed upon her, he preserved a sorrowful silence. His faithful companion at length expired, he languished from that time, and survived her only a few months.

Two remarkably fine ostriches, male and female, were kept in the Rotunda of the Jardin du Roi in Paris. The skylight over their heads having been broken, the glaziers proceeded to repair it, and in the course of their work, let fall a triangular piece of glass. Not long after this, the female ostrich was taken ill, and died after an hour or two of great agony. The body was

opened, and the throat and stomach were found to have been dreadfully lacerated by the sharp corner of the glass which she had swallowed. From the moment his companion was taken from him, the male bird had no rest; he appeared incessantly searching for something, and daily wasted away. He was moved from the spot, in the hope that he would forget his grief; he was even allowed more liberty, but nothing availed, and he literally pined himself to death. And yet the ostrich has been termed the Saturn of birds, capable of digesting iron, of grinding glass to powder, and of not knowing what compassion meant.

A gentleman who resided in this country, had for some years kept two brown cranes (*Ardea pavonina*); one of them at length died, and the survivor became disconsolate. He was apparently following his companion, when his master introduced a large looking-glass into the aviary. The bird no sooner saw his reflected image, than he placed himself close to the mirror, plumed his feathers, and showed every sign of happiness. The scheme answered completely, the crane recovered his health and spirits, passed almost all his time before the looking-glass, and lived many years afterwards.

The psychological explanation of these actions among animals lies in their custom and intercourse with each other, but as regards their feelings towards man, we must look to another source, which is the animal mind, and a bias of inclination which is not to be diverted.

GENEROSITY.

THE generosity of an animal consists in its forbearance, in not resenting an injury, in its disinclination to injure by its superior strength, and the passive manner with which it submits to the teasings of smaller animals and children. Dogs, especially large ones, permit a greater license to children than they will to adults, and will suffer themselves to be insulted with impunity by little curs, rather than punish them. M. Lizars' Great St. Bernard's dog "Bass" would run away rather than quarrel, but when compelled to fight by any perseverance in the attacking party, he would turn upon him, threw him down in a moment, and then, without biting him, lay his whole immense bulk upon him till he was nearly smothered. Dr. Abell, in one of his lectures on Phrenology, related a very striking anecdote of a Newfoundland dog in Cork. This dog was of a noble and generous disposition; and when he left his master's house was often assailed by a number of little noisy dogs in the street. He usually passed them with apparent unconcern, as if they were beneath his notice. But one little cur was particularly troublesome; and at length carried his petulance so far as to bite the Newfoundland dog in the back of his foot. This proved to be a step in wanton abuse and insult beyond what was to be patiently endured; and he instantly turned round, ran after the offender, and seized him by the skin of his back. In this way he carried him in his mouth to the quay, and holding him some time over the water,

at length dropped him into it. He did not seem, however, to design that the culprit should be punished capitally; and he waited a little while till the poor animal, who was unused to that element, was not only well ducked, but near sinking, when he plunged in, and brought him out safe to land.

It would be difficult to conceive any punishment more aptly contrived, or more completely in character. Indeed, if it were fully analysed, an ample commentary might be written in order to show what a variety of comparisons, and motives, and generous feelings entered into the composition of this act.

Elephants are particularly imbued with generous feelings, and we have seen that ferocious beasts have spared little animals that have been put into their dens, and have become affectionately attached to them.

VANITY—LOVE OF PRAISE AND ADMIRATION.

Traces of vanity and fondness for display are discoverable in birds. With what self-complaisance do they ruffle their feathers and display all their beauties, strutting and suiting the actions of their bodies to the dignity of the moment!—as with the peacock, turkey, and grouse.

Griffith, in his translation of "Cuvier's Animal Kingdom," thus describes the manners of the cock of the wood (*Tetrao urogallus*): "The old male is fond of retiring to the spot which has been the scene of his early amours; he generally makes choice of the declivity of some mountain, exposed to the first rays of the sun, in

the neighbourhood of a torrent where pine trees grow; and there, with a cry peculiar to the species, he calls the females, who assemble on the ground round the tree on which he perches. This fine bird, with his eyes sparkling, the feathers of his head and neck erect, his wings extended, and his tail raised and spread out, parades proudly over the thickest branches, and often on the trunk of some tree which has fallen; in this attitude he makes the solitudes re-echo with his voice, which bears no indistinct resemblance to the whetting of a scythe, &c. At these moments he is so entirely absorbed with himself, that he loses all regard for his safety, and is then easily approached by the sportsman.

At moulting time, and when shorn of their beauty by accident or combat, birds mostly seek secluded and sheltered spots. What object can look more pitiable than the defeated cock!—with drooping tail and draggled plumage, he is the very picture of dejection, and slinks away to hide his fallen vanity and defeat, unequal to resent the insulting challenges of the little tyros of the yard, who had before fled at his approach.

The higher orders of quadrupeds are particularly fond and conscious of display. Both the horse and mule are proud of costly and gay caparisons, and in Spain, as a punishment to the latter for disobedience, it is usual to strip it of its gaudy coronal and bells, and to transfer them to another. The elephant allows himself to be clothed, and seems to have a pleasure in being covered with gilded harness, and brilliant housings. The Swiss, when they return with their cattle from their mountain pastures in the autumn, place garlands round the necks and horns of the favourite beasts, which are evidently aware of the dis-

tinction, to which fact Schiller draws attention in his "Wilhelm Tell:"

> RUODI. See with what pride yon steer his garland bears!
> KUONI. He knows himself the leader of the herd;
> But strip him of it, and he'd die of grief.

Elephants, horses, and dogs possess a higher degree of emulation, and are more susceptible of praise than any other animals, which they express the acknowledgment of by many demonstrations of satisfaction and joy. Plutarch relates the story of an elephant, which having been taught to dance, and been beaten for not having his lesson perfect, was observed, the night afterwards, in a meadow practising it by himself. Another, which was directed to force a very large vessel into the water, found the work superior to his strength; and his master having bid the keeper to take the lazy beast away, and to bring another, the poor animal instantly repeated his effort, and died in the attempt. The horse again puts forth its speed and strength at the voice of its master, and bows its head, and curves its neck to receive the caresses it has earned. The dog exerts itself and flies to execute the bidding of its master, and his whole bearing expresses self-satisfaction and delight at the praise he receives as his reward; but conscious of disgrace if unsuccessful, he hangs back and fears to approach his master's side.

PREDOMINANCY.

It has been already mentioned that younger animals yield obedience to the elder; and this law of nature prevails throughout the animal world as long as the young remain in the society of their parents, and continues in full force, without any opposition being ever offered to their authority, till it ceases altogether as soon as the young can provide for themselves, and are entirely discarded. Lerent saw some young bears, which were almost equal to their mother in power, and yet submitted patiently to her corrections; one of them which sat howling by her and coveting a bone she was gnawing, but without presuming to touch it, received a severe cuff for its impatience, and at once quietly drew back.

*A young elephant had received a violent wound in the head, the pain of which rendered it so frantic and ungovernable, that it was found impossible to persuade the animal to have the part dressed. Whenever any one approached, it ran off with fury, and would suffer no person to come within several yards of it. The man who had the care of it, at length hit upon a contrivance for securing it. By a few words and signs, he gave the mother of the animal sufficient intelligence of what was wanted; the sensible creature immediately seized the young one with her trunk, and held it firmly down, though groaning with agony, while the surgeon completely dressed the wound; and she continued to perform this service every day till the animal was perfectly recovered.

* Bingley.

D'Obsonville says that when young monkeys are at play together, and are malicious in their antics, the dams spring on them, and seizing them with one paw by the tail correct them severely with the other.

Among social animals, the oldest or most powerful of the community assumes the leadership, as with wild horses, and elephants; the deer, and the chamois, and the reindeer in their migrations, are under the direction of leaders; and monkeys, when in troops, are directed by one individual of their body.

It sometimes happens that the superiority is yielded to the animal possessing the most intelligence, or that he himself assumes it and knows how to assert it. Cuvier illustrates this by citing the case of a goat that had lost one of its horns. A peccari, in the menagerie in Paris, kept the dogs with which it lived in complete subjection, usurped the best place in their shed, and would only permit one, to which it showed a preference, to come near, and would allow none of them to feed till it had satisfied its own hunger. Le Vaillant relates that his monkey used to disturb his dogs in the morning, compelling them to turn out and to go where he directed them. An oran-otan kept a whole range of other monkeys in subjection, threatening them with a stick, and tyrannising over them, while they grinned and chatted their submission. The trumpeter-bird, when tamed, attends its master as often as he sits down to table, and begins by driving the dogs and cats out of the room. It will admit of no rivals, for when at table, it bites fiercely the naked legs of the negroes and other domestics who approach its master. By its intercourse with man, its instincts become moulded like those of dogs, so that it can be trained to attend a flock of sheep. One has been known to drive cattle before it

to join the herd, and to prevent horses from leaving their stalls by screaming and threatening with its beak.

Wild elephants generally march in troops, the oldest keeping foremost, and the next in age bringing up the rear, while the young and feeble occupy the middle, but this order is not observed except in perilous marches. In ordinary cases the largest tusked males put themselves at the head, and if they come to a river, are the first to pass it.

JEALOUSY.

This is a very prevailing passion in animals, particularly in such as have been accustomed to be petted and caressed; for considering these tokens as their exclusive right, they show serious displeasure when their owners bestow any mark of attention towards other creatures. This is habitual to parrots, which scream with rage, and attempt to fly at the individual, whom the person they are attached to, may happen to caress; and should the attention be shown to one of their own species, their anger knows no bounds. One in the author's possession deliberately left its perch on such an occasion, and ascending that of its smaller rival, destroyed it before assistance could arrive, and screamed and crowed with exultation. Monkeys also are extremely jealous of each other as well as of individuals; the oran-otan in Paris, when ill and lying on the knees of its keeper, would allow no one, and particularly children, to approach him. Burdach saw the little dog of an old lady fly at a gentleman who sat down by her and took her hand; and another made a violent attack upon a child which had been caressed by its mistress. Larger

dogs claim some share of attention by thrusting their noses into the hand to prevent a rival from monopolising their master too much. The keeper of a pair of lions in one of our menageries, into whose den he was in the habit of entering, was with difficulty rescued from the lioness, which was jealous of a preference shown to her mate. The domestic cock will allow no rival to approach his harem; and a robin having established itself in a domain, will not permit the intrusion of another of its species without a severe contest. The males of deer and cattle are extremely tenacious of their rights, and engage in instant battle with the trespasser; the former are unremitting in their vigilance, patrolling incessantly with blood-shot eye and threatening aspect around their herd.

HATRED.

MANY antipathies are congenital, and therefore instinctive, as that of herbivorous against carnivorous animals, and of the smaller birds against owls, which are attacked and mobbed when they venture abroad in the day-time. The rook tribe have a particular aversion to the larger owl (*strix bubo*); they collect at the sight of him, and attack him even in his thicket. Nearly all birds of prey are attacked by the lesser tribes, whose instinctive hatred is unquenchable.

Hatred in these respects arises from instinctive dread, but there are others, where it assumes the form of personal enmity, which destruction alone can allay. Thus the dog, when he is strong enough, attacks the wolf, the mule, the bear, and the fox destroys the martin, without touching it for food. The same

antipathy extends also towards harmless animals; the dog and the pine-marten kill the mole without devouring it; horses cannot endure the presence of the rein-deer and of the camel, and the deer shuns all contact with the sheep. It again assumes a hostile character between animals of closely allied species, as is witnessed in the persecution of the black by the white swan; and in the pitched battles and slaughter of two colonies of ants.

The motive which induces animals to attack and even destroy the wounded and disabled of their own species, arises from an impulse which is not easily defined, but the deed is perpetrated under feelings of the most intense hatred. When a wolf or hyena is wounded, its companions instantly tear it to pieces and devour it; and among domestic dogs, the persecuted, defenceless cur, yelping in its flight from the brutality of the idle urchins in the streets, is chased and worried by every dog within hearing of its distress. Among a brood of partridges reared under a hen, one, when grown up, received a wound in the back, and was ultimately persecuted and killed by its fellows. There exists an instinctive repugnance to everything unnatural or revolting.

Independently of this inexplicable and innate hatred, we find another description, which takes a temporary and uncontrollable dominion of animals during its continuance, and which, when not resulting from their own passions, is the effect of long-remembered cruelties and maltreatment. M. Sonnini says that he has seen camels weary of the impatience of their rider, stop short, turn round their long necks to bite them, and utter cries of rage. In these circumstances the man must refrain from striking his beast, as that would but increase his fury. Nothing can be done but to have

patience, and to endeavour to appease the animal by patting him with the hand, when, after a little while, he will resume his way and his pace by himself. Camels have their periodical fits of rage, and during these they sometimes have been known to take up a man in their teeth, throw him on the ground, and trample him under their feet. Elephants are sometimes seized with a ferocity, which renders them wholly untractable, and makes them so formidable that it is often necessary to kill them. This has occurred twice in this country, once with the celebrated animal at the late Exeter 'Change, and again recently at Liverpool, where the beast destroyed its keeper. In the progress of the embassy from the Vizier of Oude to Calcutta, to meet Lord Cornwallis, a male baggage elephant, carrying a number of people on his back, was suddenly irritated by his *Mahout*, who struck him violently with his hawkuss. The unhappy man was in an instant pulled from his seat by the enraged beast, who suspended him by his trunk in a way which rendered escape impossible, and then dashed him to pieces. Another of these animals which was most attached and obedient to its keeper, was beaten by him when in a state of drunkenness; it lost its cheerfulness, and no longer performed its duty with its wonted alacrity, and being in consequence ill-treated by him, it broke loose with a scream of rage and attempted to destroy him, and became ungovernable from fury whenever it saw him; in spite of every effort to appease it and overcome its antipathy, it remained ever after misanthropic and undocile.

The memory of wrong, and the hatred which it engenders in most animals, and particularly in domesticated ones, become concentrated, and seek to gratify themselves in revenge.

REVENGE.

When an animal meditates revenge, it carefully disguises its resentment till a favourable opportunity presents itself for its gratification. The mental constitution with respect to the sense of injury varies in different races: in some the exciting action is either weak or altogether powerless, while in others it is blind and destructive in its implacability, and if not satisfied, remains rankling in the mind till even death itself ensues. A young chimpanzee, which had been treated with considerable cruelty, and was unable to get at its tormentor, pertinaciously refused its food, and died on the fifth day.

The first consequence of mal-treatment or of over-tasked energy displays itself in obstinacy. The camel and llama, when over-laden, refuse to rise, and will perish rather than make the effort; but this is of a negative character, for revenge in its true sense is an act perpetrated on another. Among the annals of animals, instances, whether of deferred or immediate revenge, are most numerous. Monkeys, when affronted or hurt, whether by man or beast, are prompt to resent the offence at once, but if that be impossible they watch their opportunity to retaliate, and save themselves by instant flight, grinning with delight. A pig, which was robbed of its food, and bitten by a dog, watched a convenient moment, and having bitten the dog severely in the leg, ran grunting off.

The following circumstance is related in "Cuvier's

Animal Kingdom" as having occurred at the siege of Bhurtpore, in India, 1805:—At one of the wells near the camp, from which the army fetched water, two elephant drivers, each with his elephant, the one remarkably large and strong, the other comparatively small and weak, were at the well together. The small elephant had been provided by its master with a bucket for the occasion, which he carried at the end of his trunk; but the larger animal being destitute of this necessary vessel, either by his own accord, or by desire of his keeper, seized the bucket, and easily wrested it away from his less powerful comrade: the latter was too sensible of his inferiority openly to resent the insult, though it was obvious that he felt it; but great squabbling and abuse ensued between the keepers. At length the weaker animal, watching the opportunity, when the other was standing with his side to the wall, retired backward a few paces, in a quiet unsuspicious manner, and then rushing forward with all his might, drove his head against the side of the other, and fairly pushed him into the well. The remainder of the tale is extremely amusing, but too long to recite.

A soldier who had refused to make way for, and had intercepted, an elephant in the street, was met by the animal a few days after by the banks of the river, and, seizing him, plunged him forcibly in the water. M. Navarette says, that at Macassar an elephant-driver had a cocoa-nut given him, which, out of wantonness, he struck twice against his elephant's forehead to break it. The day following the animal saw some cocoa-nuts exposed in the street for sale, and, taking one of them with its trunk, beat it about the driver's head, and killed him on the spot.

The generous nature of the horse is seldom roused to

resent an injury, but, as a worm will turn, he has been known to execute fearful vengeance.* A person, one of whose hunters had never tired in the longest chase, once encouraged the cruel thought of attempting completely to fatigue him. After a long chase, therefore, he dined, and, again mounting, rode him furiously among the hills. When brought to the stable, his strength seemed exhausted, and he was scarcely able to walk. The groom, possessed of more feeling than his brutal master, could not refrain from tears at the sight of so noble an animal thus sunk down. Its owner some time after entered the stable, and the horse made a furious spring upon him, and had not the groom interfered, would soon have put it out of his power of ever again misusing an animal.

Camels have a great share of intelligence, and the Arabs assert that they are so extremely sensible of injustice and ill-treatment, that, when this is carried too far, the inflictor will not find it easy to escape their vengeance; and that they will retain the remembrance of an injury till an opportunity offers for gratifying their revenge. Eager, however, to express their resentment, they no longer retain any rancour when once they are satisfied; and it is even sufficient for them to believe they have satisfied their vengeance. Accordingly, when an Arab has excited the rage of a camel, he throws down his garments in some place near which the animal is to pass, and disposes them in such a manner that they appear to cover a man sleeping under them. The animal recognises the clothes, seizes them in his teeth, shakes them with violence, and tramples on them in a rage. When his anger is appeased, he leaves them, and then the owner of the

* Rolle.

garments may make his appearance, and, without any fear, may load and guide him as he pleases.

Dogs are prone to resent an injury received from one of their own species, and, while mostly forgiving to their masters, to treasure up and revenge any wrong received from others, or offered to their masters, even to the extent of discovering their murderers.

Le Vaillant's ape, which has been often referred to in these pages, took an inveterate dislike to an officer, who, to test its sagacity, pretended to strike its master. When it saw him at a distance, it exhibited the fiercest anger, and was compelled to be restrained from flying at him.

Insects, such as bees and wasps, turn on an intruder, and revenge themselves at the cost of their lives, and venomous reptiles, peaceful if unprovoked, retaliate fearfully any injury they receive.

On a review of this passion in all its phases, it will be seen that the benevolence of the Creator has so restricted its powers, that its violence is never aroused excepting under cases of gross provocation and wrong; and that where man suffers from its effects, he has made himself amenable to them, by forgetting that the animal world, endowed with passions and sensations of the highest order, was given into his hands for use, and not for abuse.

SUBJUGATION, TAMING.—DOMESTICATION, TRAINING.

Impulse is the exciting power in animals, and this they seek to gratify in defiance of every obstacle, but they nevertheless often yield to circumstances directly at variance with their impulse, particularly if they are sagacious enough to perceive that they tend to some future benefit; and in such cases their intelligence supersedes every other feeling.* An elephant that had received a flesh wound from a ball in one of the wars in India, after having been conducted two or three times to the hospital, where he extended himself to be dressed, used afterwards to go alone. The surgeon did whatever he thought necessary, applying even sometimes fire to the wound; and though the pain made the animal often utter the most plaintive groans, he never expressed any other token than that of gratitude to this person, who by momentary torments endeavoured, and in the end effected, his cure.

Animals subject their passions and powers, not only to the disposition, but even to the will of men, and become thereby serviceable and domesticated, which aptitude on their parts is of incalculable benefit to mankind, since there would be no human possibility of subjugating them, were there not a strong principle of submission implanted in them. But to take advantage of this, man must be acquainted with their several properties and characters, and must himself have attained to a certain degree of civilisation. The savage races

* Bingley.

which support themselves on fruits and roots, as well as those which subsist on fish, have consequently no domestic animals, while the hunter has his dog for his companion, and the shepherd and the husbandman are surrounded by their flocks and herds.

Subjugation has been accomplished by tearing the animal from its natural state, by altering its condition, by increasing its wants, by creating in it new desires, by providing the means of satisfying them, and by making it thus feel its entire dependence on man. Cuvier describes it as "seduction."

In earlier years it was generally believed that herbivorous animals possessed a more gentle and docile character than the Carnivores. The gazelle was the picture of gentleness and beauty, and the hind and other animals, with their swift and graceful gait, and large beaming eyes, were the emblems of timidity and softness; while deadly cruelty and violence were ascribed to the tiger, the wolf, and the hyæna. But by the acute and persevering observations of Cuvier, the character of these animals has been placed in a clearer light, and the long adopted opinion has not only been discarded, but reversed. The full-grown males of the Ruminants are wild and ungovernable, and are not to be moved to gentleness and gratitude by the kindest treatment; for even if they recognise their attendant, they show no attachment to him, and if he be not always on his guard with them, and they be not restrained by fear, they are ever ready to inflict some injury on him.

"Repeatedly," says Cuvier, "an herbivorous animal, notwithstanding its apparent gentleness, breaks out into a fit of frightful rage, while the carnivorous beast, true to its character, never deceives by any outward

semblance. When he contemplates mischief, he proclaims it by his manner and actions, and when he is disposed to gentleness, he proves it in the same manner." The carnivorous animals attach themselves to their keepers, and are thankful for their kind offices; and even the hyæna, the blood-thirsty monster, as he has been described by all naturalists since the days of Buffon, crouches, when gently treated, like a dog at the feet of his master, allows itself to be caressed and fed by him, and shows the greatest attachment and obedience.

The cause is obvious, and consists in the fact that Ruminants generally have very limited powers of intelligence, while the Carnivores possess them in a high and refined degree, and display them in a favourable rather than in a noxious light. Animals, therefore, which stand at zero in the scale of intelligence are not to be tamed, and it is only where the first glimmerings of intelligence are visible that we begin to find the task of taming possible.

The first authenticated instances are to be found in the family of the spiders. Pelisson tamed a spider in his prison; and the daughter of the Count of Bearn kept one imprisoned in a little bottle, and fed it with flies, till at last it took them from between her fingers. Ascending to a higher grade, we find that fish can be tamed. A multitude of sea-fish are kept in the ponds at Port Nessok, which have become so tame that they come open-mouthed in crowds to the banks when any person approaches. Their sense of hearing is so acute, that they recognize the steps of their keeper; the pond seems alive, and the whole population, swarming into activity, crowds simultaneously to one spot, scuffling over one another, each one trying to reach the surface,

and pressing on as if they would devour the keeper, in their impatience to receive their accustomed food at his hands. Some fish are so tame that they feed boldly from the hand, and one great codfish, the patriarch of the pond, would heave itself out of the water, and, laying its head on a stone, would permit itself to be patted, while it snapped at its food.

Reptiles are capable of being tamed also. A green tree frog has been so tamed as to allow itself to be carried about the room on the finger to catch flies, and to return to its post after having made its spring. In the Rio San Domingo, on the Western Coast of Africa, M. Brüe was astonished to find the crocodiles, usually considered such ferocious animals, perfectly harmless, insomuch, that the children played with them, mounted on their backs, and even beat them, without danger or any appearance of resentment. This gentleness of disposition, he says, proceeded from their having been always kept well fed, and from the attention paid to them by the natives; for in all other parts of Africa they attack indiscriminately men and animals. The alligator, when caught young, may, in some measure, be domesticated. Dr. Brickell saw one in a large pond before a planter's house. It remained nearly half a year, during which time it was regularly fed with the entrails of fowls and raw meat. It frequently came into the house, where it would remain for a short time, and then return again to its shelter in the pond. It was supposed at last to have stolen away to a creek near the plantation, for it was one day missing, and from that time was never seen. Mr. White, in his "Natural History of Selbourne," in speaking of an old tortoise, called Timothy, says that it distinguished those persons from whom it was accustomed to receive atten-

tion, and whenever its mistress, who had waited on it for more than thirty years, came in sight, it hobbled, with awkward alacrity, towards her, whilst to strangers it was altogether inattentive.

Mr. St. John once saw a tamed rattle-snake, as gentle as it is possible to conceive a reptile to be. It went to the water and swam whenever it pleased; and when the boys to whom it belonged called it back, their summons was readily obeyed. It had been deprived of its fangs. They often stroked it with a soft brush, and this friction seemed to cause the most pleasing sensations, for it would turn on its back to enjoy it, as a cat does before the fire. The common snake is easily tamed, and may be made to distinguish those who caress and feed it. Mr. Bell had one which knew him from all other persons; and when let out of his box would immediately come to him, and crawl under the sleeve of his coat, where he was fond of lying perfectly still, and enjoying the warmth. It was accustomed to come to his hand for a draught of milk every morning at breakfast, which it always did of its own accord; but it would fly from strangers, and hiss if they meddled with it. A brother of the author's kept one in the same manner for a considerable time, and allowed it to nestle in his breast. A man of the name of Wilkinson, in New South Wales, used to carry snakes about with him in his naked breast, and in his hat, and suffer them to nestle in his bed.

It cannot for a moment be assumed that the subjugation of animals, as when we compel them to our service or restrain them by confinement, is effectual in taming them. The tamed animal, like that in a state of nature, employs its faculties according to the position in which it is placed and in union with its

inclinations; and it therefore follows, that a wild animal cannot be rendered obedient by force. It has no natural impulse to attach itself to man: it flies when it fears us, and hates us when it is captured, and it is only when we gain its confidence by kindness that we can succeed in attaching it to us: we create in it an inclination which was before a stranger to it. Turner remarks that it is one of the great distinctions of the animal mind, and of its similarity, within its prescribed scale and compass, to our own, that it is both teachable to several intelligent actions, and also susceptive of moral docility. Thus far it is improvable, and not beyond. By this limitation it is divided from the human soul, of which an indefinite and unceasing improvability is its universal property, though the largest part of mankind but little avail themselves of it. But that degree of moral ductility and capacity of education which taming exhibits, seems to be a general quality of the animal kind, as the fiercest have been subject to it. Even the tiger, which may be considered as the fiercest of the fierce, has exhibited this improvability. So has the savage and voracious hyæna, and the leopard likewise. The wolf has also shown that it possesses what may be termed affectionate qualities. The baboons become vigilant guardians of their protector's property. These facts prove that there is nothing in the nature of the wildest animals to make their future gentleness and sociability either impossible or improbable. We see by the dog and cat that the carnivorous may be mild and friendly; as we find those which feed on grass may be wild. Even the devourers and their prey may, by kind and judicious management, be trained to live peaceably and harmlessly together. Nothing appears more effectual to produce

this pleasing melioration than patient and persevering, kind and gentle treatment. They are now wild and savage, from the appointed circumstances amid which they are at present ordained to live; and when this state of the universe shall be altered, their moral transformation will become a natural appendage to the great social and intellectual revolution which the Hebrew prophets attach to the ulterior ages.*

The jackal, when taken young, acquires the same affectionate disposition as the dog. The lion has been repeatedly tamed, and so has the fox. Rubens had a tame lion four weeks in his room to paint from. The late Mr. Kean kept a tame puma at large in his house. Pennant saw an hyæna as tame as a dog. The ounce is tamed to hunt, and becomes as tractable as a pointer. The large tiger-cat is easily tamed. The mountain-lynx has mild and gentle manners. The Egyptian ichneumon may be softened so as to be kept in a house like a cat. The otter may be taught to catch fish for its master. The ferret is domesticated, and employed to catch rabbits. The weasel may be trained to follow a person anywhere. We see the bear repeatedly in our streets. The badger may be also made docile if caught young. The racoon is easily tamed, and sportive, but unlucky and inquisitive, like a monkey. The rhinoceros and hippopotamus may be tamed in some degree. The tiger, if taken young, may be domesticated; one, six weeks old, was taken on board the Pitt, East Indiaman, many years ago, and arrived in England before it had quite completed its first year. It was as playful as a kitten, and frequently slept with the sailors in their hammocks; it would run out on the bowsprit, climb about the ship like a cat, and play with a dog there.

* Isaiah, xi. 6—9 and lxv. 25. Hosea, xi. 18.

Deposited in the Tower of London, it continued thus to be perfectly good-natured, and was never guilty of any savage tricks. It permitted a puppy terrier and mastiff to be successively its inmates, and recognised with delight the ship's carpenter, who came to see him two years after they had been separated, licked his hands, and fawned on him like a cat. The Faquirs of Hindostan frequently go about with tame tigers. Bishop Heber mentions that Mr. Trail, in India, had a hyæna for several years which followed him like a dog, and fawned on his acquaintance. Mrs. Bowditch, widow of the Ashantee traveller, had a tame leopard, of which a long and most interesting account is to be found in Loudon's "Magazine of Natural History." Gesner mentions that Francis I. kept one, which he used for hunting. It was carried before him by an attendant on a horse. Mr. Barrow procured a young one in Africa, which became instantly tame, and as playful as a kitten.

Cuvier describes a young wolf that was brought up like a young dog, it became familiar with every person whom he was in the habit of seeing, followed his master everywhere, was obedient to his voice, and differed in nothing from the tamest dog. Its owner gave him to the Royal Menagerie at Paris, and was affectionately recognised by it eighteen months afterwards. When, after another absence of three years, he went to it, though it was dark, it knew him by his voice; placed its fore-paws on his shoulders and licked his face, and became ill and pined because he went away.

Kolben mentions the baboons at the Cape, that if brought up young with milk, they become as watchful over their master's things as a house dog. Le Vaillant declares of the one he had, that it was more watchful

than any of his dogs, and frequently warned him of the approach of predatory animals, when the dogs seemed unconscious that they were near. Father Carli, in his History of Angola, mentions that he had taught monkeys to attend him, to guard him, while sleeping, against thieves and rats, and to fetch water.

The bison and the buffalo, though granivorous, are fierce and dangerous; and Mr. Cunningham, in his account of New South Wales, remarks, "our *wild* animals are numerous, but few of them are carnivorous."

In 1827, M. Pelletau, Director of the African Company at Senegal, trained a lion caught in the forest there, to be very tractable, and to live in amity with the other animals which his master kept. He slept in the same place with sheep, dogs, cats, monkeys, geese, and ducks. When eight months old, a terrier brought forth two puppies in his bed, which excited a great interest in him, and he caressed them as if their parent. At New Hargard, in Germany, the landlord of an inn placed on the floor a large dish of soup, and then gave a loud whistle; immediately a mastiff, an Angora cat, an old raven, and a large rat with a bell round its neck, entered the room, and fed out of the dish together. John Austin, who exhibits his domestic menagerie in the streets of London, has occupied himself for years in training creatures of opposite natures to live together in content and affection. Cats, rats, mice, hawks, rabbits, Guinea-pigs, owls, pigeons, starlings, and sparrows, all live in harmony together. He effected this amity by keeping them all well fed, and by accustoming them to each other at a very early period of their lives.

As regards the power of subduing the animal mind by human ingenuity, the Reverend H. Townsend

mentions a man in Ireland, who would make any horse, however vicious or unruly, become, in half-an-hour, gentle and tractable, and permanently so. When sent for, he ordered the stable-door to be shut, and not to be opened until he gave the signal. After being alone with the horse for half-an-hour, during which little or no bustle was heard, he ordered the door to be unclosed. The refractory horse then appeared lying down, and the man by his side, playing with him familiarly as a child with a puppy. He was tried again with a trooper's horse, that would not stand to be shod, and completely succeeded. Mr. Townsend adds, that the animal appeared to be terrified whenever Sullivan either spoke or looked at him.

The application of the various means in use for taming animals must depend greatly on the character and disposition of the individual animal to be tamed; for where kindness and gentleness are necessary with the timid, firmness and correction are essential to the bold and surly. Cowper, in describing his three hares, says that each had a character of its own: Puss was tamed by gentle usage; Tiney was not to be tamed at all; and Bess had a courage and confidence that made him tame from the beginning. The science both of horse- and dog-breaking rests entirely on this rule, for till the breaker thoroughly understands the character of the animal he has in hand, his task can be attended with no good result, and the misapplication of his powers, through misconception of character, may end in rendering his charge perfectly unserviceable and worthless.

Hunger, fear, dread, and the deprivation of sleep are, under certain circumstances, the most powerful auxiliaries in subduing and taming animals. Exhausted

nature or servile submission produce a pliancy, which it is the duty of art to improve. As soon as confidence is established, and the feeling of dependence implanted, and custom and good treatment have made the society of man necessary to an animal, perfect dominion has been obtained; and the animals submit to compulsion and even to punishment without resistance—their proper inclinations are in fact paralysed. But till brutal violence, or age and decayed powers have subdued and broken the animal's spirit, some care and forbearance are necessary to keep the latent passions within bounds. The unruly horse, and goaded bull, lashed into rage, and perhaps madness, by cruelty, or undue severity, give fearful proofs of their defiance of the authority, whose word before was law.

Domestication is the result of the acquired or natural tameness of social animals; and according to Cuvier, none but such animals as live in societies in their natural state, can be domesticated; for, as he says, "if all animals resembled the lion, the fox, or the hyæna, which seek solitude, and even avoid their congeners, we should have no domestic animals. We might, perhaps, by perseverance, create races from among them, which, like the cat, would accustom themselves to man and his dwellings;" but if the cat accustoms itself to human intercourse, it is not properly a domestic animal, a member of the household; it receives kindnesses, but is neither submissive, docile, nor serviceable, like true domestic animals. A high range of mental powers, a ready submission to the will of man, a gentleness of character, fear of punishment, and gratitude for benefits, are capable of taming an animal, but are not sufficient to domesticate it, as the disposition thereto requires not only a strong social impulse, but the possession of

certain inclinations. All social animals are not capable of being domesticated, as monkeys, which are both social and intelligent; but whose excitable and restless characters prevent them from being entirely subservient.

All the animals that we have succeeded in domesticating, compose societies of greater or lesser magnitude in a state of nature.

When, by means of benefits, we have succeeded in gaining the attachment of individuals of a social race, we have then converted and applied the impulse which connected them to each other to our own advantage. The habit of living and of associating with us becomes a necessary part of their existence, and an adaptation of the social impulse; the pet sheep brought up by the hand, follows its protector as instinctively as it would the flock, had it been reared in the fold. The nature of an animal is in no respect annulled or changed; but man, on the contrary makes their nature subservient to his own purposes: domestication is therefore nothing more than a simple adaptation and peculiar embodiment of the social impulse.

We see in the actions of cows, goats, and sheep, when they are separated from their herds and flocks, how greatly they are distressed in being denied their impulse, which is a conclusive evidence that society is an actual want with them. The author saw a solitary sheep leap a high gate to join a flock which was being driven into an adjoining field. As long as an individual can satisfy this want, it is tractable and gentle, but it becomes fractious and obstinate when its gratification is denied. Domestic animals only yield that natural obedience which in a state of nature they rendered to the leader of their body, and we only obtain a greater power and control, when we tempt

their appetites, and limit those inclinations which form their natural bias.

Animals which have belonged successively to several owners, and whose natural inclinations have become consequently blunted, or altogether defunct, obey every one indifferently; while those which have known but one master, recognise only him, and refuse obedience to every other individual, and even betray hostility. The elephant will only acknowledge the authority of the Mahout to whom he has been accustomed; many horses will only permit one particular individual to mount or even to approach them; dogs, which have altogether attached themselves to one master, are often dangerous to other persons; and frequently it is not safe to go among a herd of cattle without the protection of its own herdsman.

It would be necessary to recommence the business of taming with each successive generation, if the bodily and mental changes which animals have undergone in the continued process of domestication, had not become so engrafted, as to be propagated with them. These acquired characteristics have gathered fresh strength in each succeeding generation, till at length they have assumed a permanent stamp. Certain dispositions have become hereditary in each race by human skill and exertions; and as a proof of the perfection to which this science has been brought, it is easy, by skilful application, to breed races possessing peculiar powers and endowments. Buffon says that the main cause of the degeneracy in the primeval race of dogs, and of the production of new species, is to be found in their mental dispositions, and their submission to human control.

The dog assimilates itself to those with whom it lives,

and to the positions in which it is placed, and hence arise the distinguishing traits between the shepherd's dog and the hound, and the parlour dog and the cur. The dogs of the North American Indians bear a strong resemblance to the wolf and the fox; and those of the northern inhabitants of Siberia, which pass the whole year in the open air, not only resemble the wolf in form, but even in its howl. The sledge dogs of the Kamschatdales, which are neither housed nor cared for, are not to be deterred by the severest punishment from stealing everything which they can by possibility lay hold of.

Human intercourse and the mode of treatment influence materially the extent to which domestication may be carried, and its operation on the animal mind. The cattle in the Tyrol possess more mind because they are treated with humanity and affection; and for the same reason, in the Swiss Alps, they are more lively and joyous among themselves, and more attached to their herdsmen, than in those countries where little attention is paid to them. In some parts of Limosin, where the swine are carefully attended to, they are more cleanly, docile, and attached than is ordinarily the nature of their race. It is unquestionable that the number of our domestic animals might be considerably increased by proper judgment and an intimate knowledge of the habits of animals, and that thus other races might be made subservient to our interests. The seal possesses a far higher degree of intelligence than the Rodents, and than most of the Ruminants; and as it attaches and accustoms itself readily to man, Cuvier expresses his surprise that the Ichthyophagi have not trained it to assist them in fishing; and he gives it as his opinion that nearly all the pachyderms might be tamed,

and laments that the Tapir is still unreclaimed, as it is larger and more gentle than the swine, and would consequently become a most useful domestic animal. It is to be feared that in consequence of its defenceless powers, and the search that is made after it as an article of food in America, and the extension of the population, it will soon be extirpated.

With respect to the domestication of the seal, a remarkable instance of it, mixed up with a dreadful tale of Irish superstition, is related in the "Wild Sports of the West." About forty years ago a young seal was taken in Clew Bay, and domesticated in the house of a gentleman, whose house was situated on the sea-shore. It grew apace, became familiar with the servants, and attached to the house and family; its habits were innocent and gentle; it played with the children, came at its master's call, and, as the old man described it, was fond as a dog and playful as a kitten. Daily the seal went out to fish, and, after providing for his own wants, frequently brought in a salmon or a turbot to his master. His delight in the summer was to bask in the sun, and in the winter to lie before the fire, or, if permitted, to creep into the large oven, which at that time formed the regular appendage of an Irish kitchen. For four years the seal had been thus domesticated, when, unfortunately, a disease, called in the country *the crippawn*—a kind of paralytic affection of the limbs which generally ends fatally—attacked some black cattle belonging to the master of the house; some died, others became infected, and the customary cure produced by changing them to drier pasture failed. A wise woman was consulted; and the hag assured the credulous owner that the mortality among his cows was occasioned by his retaining an unclean beast about his

habitation—the harmless and amusing seal. It must be made away with directly, or the crippawn would continue and her charms be unequal to avert the malady. The superstitious wretch consented to the hag's proposal: the seal was put on board a boat, carried out beyond Clare Island, and there committed to the deep, to manage for himself as he best could. The boat returned, the family retired to rest; and next morning a servant awakened her master to tell him that the seal was quietly sleeping in the oven. The poor animal over-night came back to his beloved home, crept through an open window, and took possession of his favourite resting-place. Next morning another cow was reported to be unwell. The seal must now be finally removed. A Galway fishing-boat was leaving Westport on her return home, and the master undertook to carry off the seal, and not put him over-board until he had gone some leagues beyond Innis Boffin. It was done—a day and night passed; the second evening closed—the servant was raking the fire for the night—something scratched gently at the door—it was of course the house-dog—she opened it, and in came the seal! Wearied with his long and unusual voyage, he testified by a peculiar cry, expressive of pleasure, his delight to find himself at home; then stretching himself before the glowing embers of the hearth, he fell into a deep sleep. The master of the house was immediately apprised of this unexpected and unwelcome visit. In the exigency the old dame was awakened and consulted; she averred that it was always unlucky to kill a seal, but suggested that the animal should be deprived of sight, and a third time carried out to sea. To this hellish proposition the besotted wretch who owned the house consented, and the affectionate and confiding

creature was cruelly robbed of sight, on the hearth for which he had resigned his native element! Next morning, writhing in agony, the mutilated seal was embarked, taken outside Clare Island, and for the last time committed to the waves. A week passed over, and things became worse instead of better: the cattle of the truculent wretch died fast, and the infernal hag gave him the pleasurable tidings that her arts were useless, and that the destructive visitation upon his cattle exceeded her skill and cure. On the eighth night after the seal had been devoted to the Atlantic, it blew tremendously. In the pauses of the storm a wailing noise at times was faintly heard at the door: the servants, who slept in the kitchen, concluded that the *Banshee* came to forewarn them of an approaching death, and buried their heads in the bed coverings. When morning broke, the door was opened: the seal was there lying dead upon the threshold! The skeleton of the once plump animal—for, poor beast, it perished from hunger, being incapacitated from blindness to procure its customary food—was buried in a sand-hill, and from that moment misfortunes followed the abettors and perpetrators of this inhuman deed. The detestable hag, who had denounced the inoffensive seal, was, within a twelvemonth, hanged for the murder of her own grandchild. Every thing about this devoted house melted away—sheep rotted—cattle died—and the corn was blighted. Of several children, none reached maturity, and the savage proprietor survived every thing he loved or cared for. He died *blind* and miserable. There is not a stone of that accursed building standing upon another. The property has passed to a family of a different name; and the series of incessant calamity which pursued all concerned in this cruel deed, is as romantic as true."

During the time that rumoured invasions by the French caused all parts of the coast of Britain to be fortified, a small party on one of the little islands in the Frith of Forth, above Edinburgh, amused themselves by taming a seal. It had all the affection and playfulness of a dog. It fished for itself, and sometimes for its masters. It fawned about them, licked their hands, and, if it did not accompany those who made an excursion in the boat, it was sure to meet them on their return. It always came to their hut to sleep, and conducted itself as if it felt that it was one of the party. Sometimes it would snatch up a stick or a brush, and scamper off to the water, where it swam about with the plunder in its mouth, often approaching the shore till within reach of its observers, and then it would be off to a distance. But though it seemed to take delight in teasing them in that way, it always ultimately came back with whatever it had taken, and laid it at their feet, fawning and fondling all the while. Indeed, if they did not give chase, it seldom remained long in the water, but came back apparently disappointed at being deprived of its sport. When they went to Leith for orders or stores, the seal generally accompanied them, swimming all the way at the side or stern of the boat; and when the boat was made fast at the pier at Leith, it took up its position inside, and kept watch till they returned. Fish was not its only food; it could eat many things, and was very fond of bread and milk. There is no saying how far its training might have been carried, but it fell out of a bed, and was killed while young.

There is every reason to believe that the whole race of the Solipedes might be tamed as effectually as the horse and the ass, and that most of the species of the

numerous family of the Ruminants might be made serviceable, either as beasts of burthen or for the value of their covering, as the llama and vicugna, whose fleeces are in high estimation.

In training an animal, we seek, either for purposes of profit or of gratification, to draw out its powers, and to mould them according to our will; to teach it to move or place itself in a particular manner, to utter a sound, or to perform certain actions, which, by constant repetitions, become so familiar to it, that it fulfills them at a mere signal. The success of the task depends considerably on the temperament of the animal, as also on its natural habits, which in some cases are entirely opposed to the attempt. Kindness and fear are the great instruments employed, which, if misplaced from not understanding the character of the animal, have the effect of rendering it worthless. Encouragement to the timid and coercion to the bold, but in all cases an abstainment from violence and impatience, are necessary observances. Training is a process of explanation, by which one must endeavour to awaken ideas in the animal, and to make them accord with those of the trainer. The animal must not only be sensible of the will of its trainer, but must be made to feel that no injury is intended to it; this is altogether indispensable, as a contrary course which inculcates terror, makes it shy and stubborn. On this principle dog-breakers never strike nor intimidate the dogs entrusted to them. In educating the ox for the plough, Mr. Cobbett recommended that "all violence and rough language should be avoided. If he be stubborn there should be no blows and no loud scolding. Stop; pat him; pat the other ox; and he will presently move on again. If he lie down, let him lie

till he is tired; and when he chooses to get up, treat him very gently as if he had been doing everything that was right. By these means a young ox will in a few days be broken to his labour. With gentle treatment he is always of the same temper, always of the same aptitude to labour." Mr. Turner says, that on the same principle an experienced cavalry officer told him he did not fear the most vicious horse and would soon cure it. He was asked as to his means, and his answer was, "Always by mild and gentle treatment and forbearing patience. If you whip them, you make them bad-tempered and continually vicious, but steady kindness and occasional humouring, as far as was safe, with a hard run now and then, to let their spirit exhaust itself, constituted always the most successful system."

In order to secure the obedience of an animal, its wants and inclinations must be humoured, and a perfect confidence established; and, besides, the breaker to gain its good will should attend to and feed it himself, allowing it occasionally to feel hunger in order that it may be the more sensible of the attention. Burdach relates an anecdote of a very fine but unmanageable horse in India which attacked every one who approached him, but was finally subdued by a groom going up to him three or four times a day disguised in a black dress, an unusual colour for that country, and taking his food away and beating him, while another groom pretended to drive the intruder away, and at the same time he restored the food with abundant caresses.

It is of the greatest importance to excite and secure the attention of the animal, and for this reason, breakers take both horses and dogs into quiet and retired spots, where nothing can occur to disturb or

distract them. An action is produced on the mind of an animal by perpetually occupying oneself with him; he soon learns to understand the modulations of the voice, and knows whether blame or praise is intended, and whether rest or exertion is enjoined. This gentle treatment makes him soon understand each word and gesture of his master's, and he becomes confident, willing, obedient, and docile.

Many animals are trained to perform certain actions under the influence of fear. At one period, in Belgium, dogs were taught to carry smuggled goods across the frontier into France. After having been frequently beaten by a person dressed up in the uniform of a Custom-house officer, they acquired such a dread of any one in that dress, that they were always on their guard, and could not be caught by the real officials. In the same manner the Russian soldiers in the Caucasus have trained their dogs to keep watch against any surprise by the Circassians. When the dogs are being fed, a man in a Circassian dress takes their food from them and beats them, and thus the dogs, having acquired a deadly animosity against the whole tribe, give instant alarm as soon as they perceive the presence of one of them.

We are daily witnesses of the docility and cheerful obedience of our domestic animals: whole herds allow themselves to be driven by a child; the dog denies its inclination, and allows its prey to be taken from it.* An elephant that had been turned loose was retaken, but broke away in a stormy night, and again escaped; and, after ten years, was driven by some elephant hunters with a herd of wild ones into an enclosure. She was recognised, and called by name, to which she paid some attention, and after some time came to the side of the

* Phil. Trans. 1799.

enclosure and received food from the hand. She retired and seemed angry when taken by the ear and ordered to lie down, but finally, a Mahout succeeded in getting on her back and driving her about the enclosure. He ordered her to lie down, which she instantly did, nor did she rise till she was desired. He fed her from his seat, gave her his stick to hold, which she took with her trunk, and put into her mouth, kept, and then returned it, as she was directed, and as she had formerly been accustomed to do. Another, which belonged to a gentleman at Calcutta, broke loose from her keeper, and was lost in the woods. The excuses which the keeper made were not admitted. It was supposed that he had sold the elephant; his wife and family, therefore, were sold for slaves, and he was himself condemned to work upon the roads. About twelve years afterwards, this man was ordered into the country to assist in catching wild elephants. The keeper fancied he saw his long-lost beast in a group that was before him. He was determined to go up to it; nor could the strongest representations of the danger dissuade him from his purpose. When he approached the creature, she knew him; and giving him three salutes, by waving her trunk in the air, knelt down and received him on her back. She afterwards assisted in securing the other elephants, and likewise brought with her three young ones, which she had produced during her absence. The keeper recovered his character; and, as a recompense for his sufferings and intrepidity, had an annuity settled on him for life.

Some young camels, travelling with one of our armies in India, had occasion to cross the Jumna in a flat-bottomed boat; the novelty of the thing excited their fears to such a degree that it seemed impossible to drive

or to induce them to enter the boat spontaneously; upon which one of the Mahouts called to his elephant, and desired him to drive them in; the animal immediately put on a furious appearance, trumpeted with his proboscis, shook his ears, reared, struck the ground to the right and left, and blew the dust in clouds towards them; and so effectually subdued one great fear in the refractory camels by exciting a greater, that they bolted into the boat in the greatest hurry, when the elephant re-assumed his composure, and deliberately walked back to his post. The same animal being desired to remove the branch of a tree, he did so, and another, and a third in succession; but being directed to tear off another still higher, he looked up, stretched his proboscis, and caught only a twig or two and some leaves; he was urged again, he shook his ears, and gave a piping sound of displeasure; but the Mahout insisting, after another vain attempt, he caught the bearing pole of a dooly (a kind of palanquin) and shook it with violence, making a poor sick soldier immediately start out of it: the hint was sufficient—he would not be trifled with. The Mahouts gain such influence over these animals, that they might be suspected of having compelled their affections by spells and medicines. Captain Skinner, in his "Excursions in India," relates the following anecdote:—"Some fault had been found with the driver of a baggage elephant belonging to my regiment, and he was dismissed. The elephant had received his lesson, and would not suffer any other drivers to come near him. Several were procured, one after the other, with excellent characters for kindness and management, but the gentlest creature seemed suddenly transformed into the most ungovernable. A month had passed without any return to rule, when the discharged driver was again taken into

service, and the elephant, delighted to see him, became once more fit to use. I have known the same tricks played with horses."

The elephant, when tamed, becomes the most gentle and most obedient of all domestic animals. He is so fond of his keeper, that he caresses him, and anticipates his commands. He soon learns to comprehend signs, and even to understand the expression of sounds. He distinguishes the tones of command, of anger, or of approbation, and regulates his actions accordingly. He never mistakes the voice of his master. He receives his orders with attention, executes them with prudence and eagerness, but without any degree of precipitation, for his movements are always measured, and his character seems to partake of the gravity of his bulk. He easily learns to bend his knees for the accommodation of those who mount him. He caresses his friends with his trunk; salutes with it such people as are pointed out to him, uses it for raising burthens, and assists in loading himself. A word is sufficient to guide him, if he has had time to acquire a complete acquaintance with his conductor, and to put entire confidence in him.

A certain degree of freedom may be given to animals under training, but it must be so calculated as to make them still feel their dependence, and to perceive that it is given them as a reward. A horse in the *longe* breaking into a gallop, must be kept at that pace, till he returns to the trot from fatigue; he must be made to feel the conviction that man is the most powerful; and no lesson must be concluded, till that which is exacted is done.

Punishment and reward vary extremely in their natures according to circumstances; the lesson is a pleasure to the sporting dog because he is released from

confinement and allowed to range; the horse, on the contrary, looks to his stall as the reward for his task, and shows no alarm at the report of a pistol if it announces the end of his labour. But in all cases instruction is the easiest when it is in accordance with the nature and disposition of the animal, and thus birds are readily taught to pipe a simple melody, and dogs, if employed according to their respective qualifications, require comparatively little training. The pelican and cormorant are trained to fish, and the falcon to hunt; the only difficulty lies in making their natures subject to human control. The Baschkirs to the present day employ the falcon in the chase of hares, foxes, and wolves. But if it be intended to teach animals to perform actions entirely at variance with their natural habits and instincts, much labour and art are both necessary, for among other things they must be made to learn that one action is dependent on another, and that one thing being done another follows as a consequence. Thus the snake-tamers in the East teach their snakes to rear themselves, or to dance, as they call it, when they hear the sound of their little pipe. The bear, too, is taught to dance by being placed on iron plates, which being heated, compel him to raise his feet alternately; and as this process is accompanied with music, he learns to rear himself up and to move about in a kind of dancing manner whenever he hears the sounds of music. Dogs and other animals that have been taught tricks are trained to be observant of some particular movement of their master's body, or the position of his leg, to indicate to them the card they are to select, or the exact point they are to make. Some which have been taught by blowing in their ears, require no other signal than the action of the lips to direct their movements.

A cat was exhibited in London in 1828, that had been trained to beat a drum, strike on an anvil, draw water from a well, ring bells, and roast coffee. The "learned pig," which was well known as making the round of most public fairs, could pick out from an alphabet on the ground, on being ordered, and without mistake, the letters that were wanted for the name of any persons present, and also the figures of the hour. The watch was placed to its eye, but the secret directing signs must have been previously established between it and its master. It went round a paper dial on the floor, and placed its snout first on the hour, and then, in another circuit, on the minutes. There was no visible concert that could be traced, so that the assisting tokens were therefore the more intellectual.

A curious exhibition took place a few years since in France. Two Italians had a number of pigeons which were placed in cages, and from ten to twelve of the same colour were put together. By dint of great patience and perseverance they had been taught several feats of the most varied nature, and quite opposed to their usual habits. As soon as the cages were opened, the pigeons ascended, mixed together and flew away; but on a signal, those of the same colour separated from the rest and came back together, each flight entering the appropriate cage. Carpets of different colours were placed upon the ground, and nets being spread, each flight on a given signal went to the carpet, or to the net pointed out for it. A flight of pigeons were then let loose, and a man having fired over them, they instantly flew to him and entered his game bag. This bird, which never before had been seen to mix in martial exercises, placed itself before the gun which

was about to be fired at it, and did not move when it was discharged; it even took a lighted match in its beak, and perched itself upon a cannon, which it discharged by applying the lighted match to the touch-hole.

These few simple examples are sufficient to prove that animals are prompt and willing in receiving instruction, but many have an intuitive perception of what is expected of them, and of the duty they owe to their masters. Lichtenstein states that it is not unusual, at the Cape, for several dogs to go out on a self-hunting expedition, and having run down their game, for one of them to return home, and by its restless solicitations to induce some one to follow him to fetch the booty; while the others remain on the spot to guard it from predaceous animals, contenting themselves by licking the blood, and waiting for the entrails as their share of the feast. Peron declares that the English seal-hunters on the South Seas had dogs which performed an equally sagacious part. Azara saw dogs in Paraguay which did the duty of herdsmen, driving out the flocks of sheep and goats to their pastures, attending, and defending them all day, and driving them home in the evening.

It would be easy to deduce many more examples of the powers of training, and of the facilities of acquirement in animals, but the subject is almost too familiar, and proofs surround us on every side illustrative of the benefits we receive, of the services we gain, and of the pleasures we enjoy, by our associations with the animal world, of which even the most unthinking must be susceptible.

The animal world deliberately and specifically made by the Almighty as it is, displays to us His deliberations

and resolutions, the thought and purposes of His sacred mind, for our contemplation and instruction.

"The great Creator condescends to write
In beams of INEXTINGUISHABLE LIGHT,
His names of Wisdom, Goodness, Power and Lov
On all that blooms below, or shines above;
To catch the wandering notice of mankind,
And teach the world, if not perversely blind,
His gracious attributes; and prove the share
His offspring hold in his paternal care."—COWPER.

Whatever the mind, in any being, does or displays, discloses that mind to us. Intellect cannot make itself known to intellect in any other way than by word or action. It is said by Dr. Hartley that brutes have more reason than they can show, from their want of words, from our inattention, and from our ignorance of the import of those symbols, which they use in giving intimations to one another, and to us. As we do not confound our own natural senses with our instincts, so neither ought we to confound the perfection of the natural senses in animals with their instincts, nor yet with that conscious intelligence they sometimes display in their intercourse with man; which intelligence, or power of comparing and drawing conclusions, and adapting means to ends, is so wisely limited by Divine Providence, that they are prevented from ever combining or rebelling in concert to injure their protector, who sometimes proves their oppressor; while they are capable of such a measure of reasoning, as qualifies them to know our wants and desires, to comprehend the reliance we place upon their ready service, and to afford their prompt assistance in extricating us from danger.

In taking a review of most, if not all, of the actions

of the animal world, it must be obvious, that whether we allow them reason or not, the actions themselves comprehend those elements of reason, so to speak, which we commonly refer to rational beings. So that if the same actions had been done by our fellow-creatures, we should have ascribed them without hesitation to motives and feelings worthy of a rational nature. It is certain that most animals in their several rational acts, show every outward sign of consciousness or knowledge of the end of their actions, not like the fixed and uniform operations of instinct, which is wholly employed in their self-preservation or in providing for their young.

If we compare our own mental constitution with that of brutes,—however we may excel them, as we certainly do, in some noble capacities and principles, exclusively belonging to our moral nature;—yet we possess many faculties and powers precisely analogous to theirs; and the motives and combined operations of these, it is often as difficult to understand as it is in those of the lower animals. So that it might be as hard a matter to prove that many acts of human volition were deliberate acts of the reasoning faculty in its abstract sense, like many actions of the lower animals:—such a variety of motives and impulses may govern the decision of a human being, prompting him to act, *not* according to the standard of reason, but according to the scale of sense or passion, and low desire. For, how rarely does enlightened reason, setting aside the higher influence of moral duty, determine the conduct of man!

THE END.

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